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11 The Blade in the Plaid Box11

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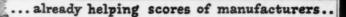
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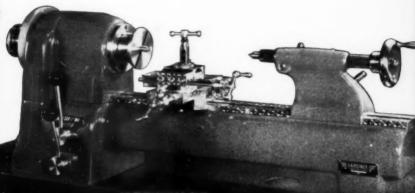
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Published Monthly

Volume 39, No. 10

OCTOBER 1943

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• Time out from actual production for routine service attention may seem like an unwarranted interruption, but its just as essential as the operator's personal fitness program. The urgency rating of production must never crowd out the still small voice of attention... attention to details of service that keeps the machine running... attention that keeps the machine producing during 98% or more of the normal working hours.

The CINCINNATI No. 2 Centerless Grinding Machine, for example, is a "bear" for work, but it, too, re-



Balance new grinding wheele; and worn nees, 000, for the wheel may lose its balance as its diameter wears down. A good time to rehalance it when the wheel mount has been resorved for cleaning the diamet grooves.



Remove wheel mounts once a week, wise the alinger grooves clean, and clean out the drain hole. (Both regulation and grinding wheels.) This will possess water and grit from contaminating the spindle oil.



ATTENTION CTION DIVIDENDS

quires routine service attention to keep going. Some of the more important items are illustrated at the left. If you will consider the time required for these chores, you will find that it takes no more than about 57 minutes of a 56 hour week. In other words, two percent of the operator's time spent in routine service attention keeps the machine producing the remaining 98% of his time.

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Lubricate machine and check of levels daily. Use lubricants specified in service literature and on machine instruction cags. Stide on machine instruction cags. Stide on machine for high broduction infeed work should be wiped clean, moved full length, see Jubricated twice such shift.



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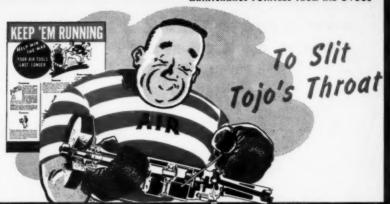
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BLADE AIDS







Blades should slide freely in the slots but not be loose. Gauge a new blade for thickness by inserting corner in the slot, as shown in Fig. 1. If too thick to slide freely, rub on fine emery cloth on a flat surface, rubbing in one direction only, as shown in Fig. 2. A clearance of .005" to .010" on the side is allowable.

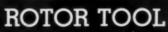
Try blade for length. If too long, rub end on emery cloth until it fits easily. See Fig. 3. An end clear-ance of .002" to .005" is allowable. End clearance is Important because if the blades are too short the tool will lose power. Care should be taken to see that the ends are kept square, as shown in Fig. 4.

Full details on Blades on Pages 5, 6 in "Keep 'em Running"

HE blades in your AIR tool . . . like the piston rings in your car . . . have a lot to do with how much power you can develop. Hence they determine how much production you contribute to the liquidation of Tojo and his mob.

Adequate lubrication makes these wearing parts last longest and give greatest power output to the tool. But, when they do wear thin, replace them with new blades. It's "penny wise and pound foolish" to keep worn blades on the job.

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Production per man per hour	5 sets (20 pcs.)	3 sets (12 pcs.)
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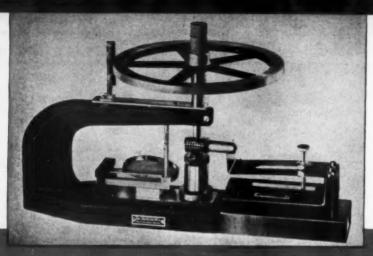
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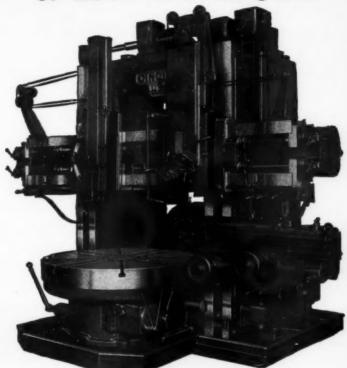
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Fixture is built with interchangeable locators for various sizes



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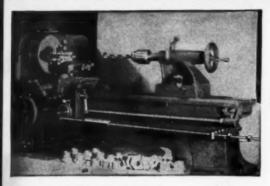
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Swing over cross-slide—6"

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"BLACK MAGIC" is what sawyers of plastics, metals and woods call the help the new Carter Guide-Line Light gives them. From the type of work speeded by 8 of these units for the New England Box Co. to that done by 2 of these units at the Portsmouth Navy Yard, sawyers of plywoods, plastics, sheet-metals and woods are increasing output, saving time and vital materials, doing the jobs better—with less eye and muscular fatigue.

1 ≠ per Hour Cost for Light!

LAMP, LENS, SHADOW-LINE and
HOUSING ARE ADJUSTABLE

SPEEDS SAWING OF PLASTICS, METALS and WOODS

Write for Bulletins
Describing These
3 NEW "VICTORY" TOOLS:

Six-page letter-head size file-folder illustrating and giving all facts on the new CARTER GUIDE-LINE LIGHT - and covering its quick, easy installation and application to all types of jobs; Two-page letter-head size file-folder on the new CARTER PRE-CISION MICRO-GUIDE (for bandsaw blades) having renewable. replaceable, micrometric - adjustable jaws and quick-detachable and replaceable guide-wheel wearing rings; and Six-page letter-head size file-folder on CAR-TER RIGID BANDSAW WHEELS with QUICK - CHANGE DE-MOUNTABLE TIRES that fit all saws (30" and 36" Size) and make any good saw better.



CARTER PRODUCTS COMPANY, INC. 204 DIVISION AVE. N., GRAND RAPIDS 2, MICH., U. S. A.

Harsen air hose couplings have rereassest air nose coupings store their ceived international acclaim for their ceived international acciaim for their remarkable day in and day out per-formance under every conceivable condition. Regardless of whether it's a small plant or a large industrial footness. S factory, if you use air you need Tactory, if you use air you need! Hansen couplings because they will save money, time and effort and increase production beyond your nicrease production beyond your present peak. They're first choice because they outperform the field.

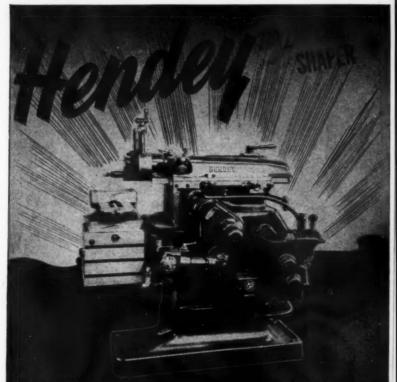
THE HANSEN MANUFACTURING CO.

1786 EAST 27th STREET . CLEVELAND, OHIO



• In all types of machine shops and manufacturing plants, Colwell Turrets have proven their value as production tools, during the past five years. On long or short runs—on simple jobs involving only turning and cutting-off to more complicated work requiring 3 or 4 tool changes, time has been saved and production increased. Positive locking device assures accuracy — cutting-off tool mounted directly in turret without use of toolholder. Send for complete description now. Good delivery.

S. G. COLWELL . 25 CONGRESS AVE., PROVIDENCE, R. I.



This small shaper has found a permanent and dominating place in many nationally known shops, because of its exceptional merit, expressed in a grade of performance hitherto unapproached in facility of operation high rate of production, and accuracy of work.

Primarily it is a high speed cutting tool. On 6" stroke it has a maximum cutting speed of 182' per minute; and on 12" stroke a high cutting speed of 120' per minute.

This 12" shaper is not limited to high working speeds alone: it has ample power at low speeds for forming tool cuts and other heavy duty work. Convenient arrangement of levers for the operator increase efficiency.

WRITE FOR FURTHER INFORMATION.

HENDEY

MACHINE COMPANY

106 Summer St., Torrington, Conn.

DO YOU KNOW THE TRUTH

About Hardness Testing?





The new Clark catalog is more than a catalog.

It is a 20-page reference manual on the history, theory, practice, and equipment for modern, scientific hardness testing. Printed in two colors, size 8½"x11", it is available without charge to manufacturing executives. Just drop a line on your letterhead to Department BB, CLARK INSTRUMENT INC., 10200 Ford Road. Dearborn. Michigan.

Use the COMBINATION DRILL TABLE and VISE



SPEEDS DRILL PRESS SET-UPS

Simplifies the most difficult set-ups. Holds work of all shapes securely, without angle plates, clamps or supports. Just drop in the work and start to drill.

The Combination is made in various sizes — diameters from 8" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify shank diameter in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.

GUARANTEE

We guarantee the Combination will save its cost in labor alone in six months, You are the judge.

FREE TRIAL

We will ship to rated concerns under this guarantee, on free trial. Should you decide not to keep the tool we will even pay return transportation. Order Today!

Circular on Request.



Gives full information and illustrates typical, set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

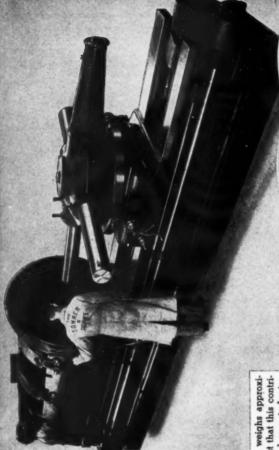
MODERN MACHINE TOOL CO.

Jackson, Michigan



ment designed and built this large boring and which handles those operstions on the breech rings Typical of special equipby Sommer & Adams is thread milling machine,

of 5" guns. It is 22 feet long, weighs approximately 60,000 pounds. We trust that this contribution may help in some small degree to hasten the coming of final peace.



acquaintance with the intricacies of places at your command a 25-year The Sommer & Adams Company special machine design and construction.



Custom-Built EQUIPMENT FOR MANY PURPOSES

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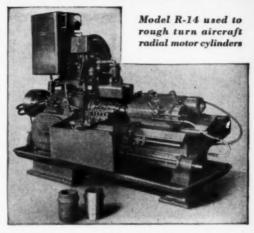
So-swing MODEL R-14 LATHE

A Big, Powerful Automatic for Armament, Aircraft, Truck and Tractor Work.

● The Model R-14, with its generous capacity and weight, provides the power, rigidity and tool support necessary for heavy, multiple-tool turning. It incor-

porates the Seneca Falls Simplified Change-Over Mechanism as a built-in feature. This mechanism makes changeover from job to job merely a matter of a few minutes adjustment. Length of carriage stroke and rapid traverse adjustment may be varied without changing any cams.

Mass, rigidity and adequate tool support to stand up under heavy cuts are inherent structural features of the Model R-14 Automatic. Positive operation, wide flexibility and servicing simplicity are important advantages accru-



ing from its typical Lo-swing, 100% mechanical design with complete absence of clutches in the feed train. All rotating shafts are equipped with antifriction bearings and are automatically lubricated. Carriage Ways are of wear-resisting Hardened Steel, thus assuring years of satisfactory service.

Model R-14 may be equipped with a Third Arm (overhead) as well as additional Back-Squaring Attachments, Carriages, Carriage Slides, and work handling devices. Send us your blueprints if you have a turning problem.



S

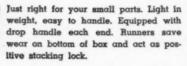
Self Centering... Quick Acting... No Slip. Attaches to any chuck plate or spindle. Provides a positive, balanced drive which reduces chatter. Handles rough forgings or turned pieces — straight or taper. Eliminates dogging time. Reduces tool breakage. Write for details and size range.

SENECA FALLS MACHINE CO. SENECA FALLS

Immediate Shipment STEEL BOXES FOR YOUR PRODUCTION NEEDS



STYLE 300 STACKING BOX



No. 301-6"x 9" x31/2" 20 ga., \$.55 Each No. 302-8"x12" x4" 20 ga., .60 Each No. 303-9"x131/2"x41/2" 19 ga., .75 Each



STYLE 600 STACKING BOX

An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as positive stacking lock and re-inforce box at point of maximum wear.

No. 601-10"x16"x6" 18 ga., \$.95 Each No. 602-12"x18"x8" 16 ga., 1.25 Each



STYLE 500 STACKING BOX

Open front makes contents easily accessible when boxes are stacked. Will stack with Style 600 Boxes.

No. 501-10"x16"x6" 18 ga. \$1.15 Each No. 502-12"x18"x8" 16 ga., 1.50 Each



STYLE 100 TAPER PAN

One piece, all-welded construction. Hook handle at each end. Will nest perfectly when empty.

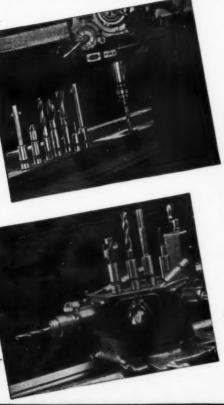
No. 101-10"x18"x6" 18 ga., \$.75 Each No. 102-12"x20"x8" 16 ga., .90 Each

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If It's Drill-Press Work, You Can Do It Quicker with



M O D E R N M A G I C

QUICK-CHANGE CHUCKS

Shops that are striving to make or break production records have learned to depend upon Modern-Magic Quick-Change Chucks and collet equipment. The time saved by these efficient tools means real dollars-and-cents to any shop man for they reduce the idle time of revolving spindles to practically zero! Because Modern-Magic Chucks enable tools to be changed while the machine is running, a sequence of operations such as boring, counter-boring, drilling, reaming, tapping, etc. can be performed practically continuously.

You'll find Modern-Magic equipment equally valuable on your Turret Lathes where there are not enough stations to accommodate the tools necessary for a particular job. Required tools may be inserted and removed one after the other, in effect adding extra stations. This equipment can also be readily adapted for use with other machines.

If you have a production problem, it's a safe bet that Modern-Magic Chucks and Collets can help you solve it. For more complete information, send for Bulletin M-101.

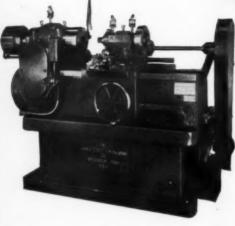
CONSOLIDATED MACHINE TOOL CORPORATION

MODERN TOOL WORKS

ROCHESTER, NEW YORK

THE COULTER





FOR THE RAPID
DUPLICATION OF
RIGHT OR LEFT
HAND THREADS
—INTERNAL OR
EXTERNAL

Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chucks, or special face plate fixtures . . . can be threaded on this machine.

Set cam-controlled automatic cycle on first piece. Thereafter, cutter feeds into work to proper depth and at correct pitch and withdraws when cut is completed. Work and cutter spindles are driven by individual motors through worm drive, affording ample power throughout the wide range of speeds and feeds.

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WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.



100 TO 400 AMPS.





OT WELDERS





SPOT WELDERS FOOT, AIR OR MOTOR OPERATED

CHAS. EISLER

Turning AND Centering



This Combination Tool is the only Right and Left Hand tool on the market. Can be changed from right to left and vice versa in 10 seconds. Replaces 14 tools costing 4 times as much.

Here are some of the multiple operations that can be done with the R and L: Pointing work concentric with turned diameter; drilling and chamfering; turning and forming special shape or end of part while drilling or reaming; turning one diameter—chamfering two corners, facing end of part along with drilling or reaming; turning two diameters while drilling or reaming; turning shoulder concentric with stock diameters.

You can readily see the enormous savings in time, trouble and money that can be effected by the use of R and L Turning Tools.

Write for 44-page booklet describing all the uses of R and L.

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33 years of precision workmanship and reliable service ... Sossner's reputation is your guarantee of satisfaction.

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High speed, precision ground from solid stock in American National, full or modified Whitworth, and British Association threads.

ALSO: STEEL STAMPS . GAGES . CUTTING TOOLS

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Large enough to successfully serve you, yet small enough to give personal attention to your needs.



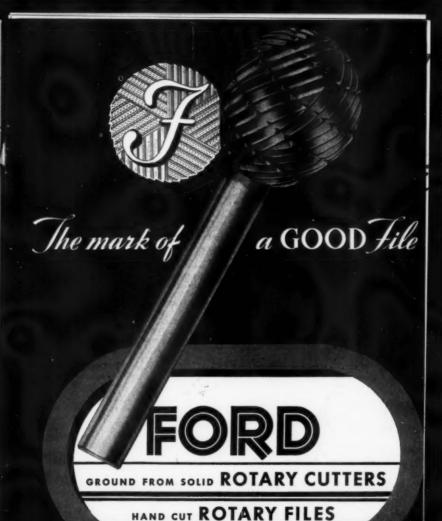
THE LIMA ELECTRIC MOTOR CO.

266 FINDLAY ROAD

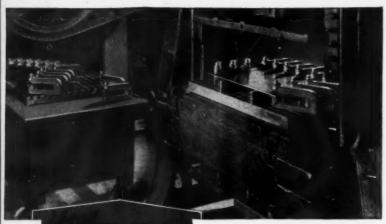
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The Complete Line . . . a right tool for every rotary filing need. Catalog showing many shapes and sizes sent on request. M. A. Ford Manufacturing Company, Inc., 746 W. First St., Davenport, Iowa.



WALES

HOLE PUNCHING UNITS

PRESS "DOWN-TIME"
BETWEEN SET-UPS

Showing set-up of Wales Units on T-slotted plate ready to operate in stamping press and second set-up of another pattern on table to replace pattern on press bed at end of run. 2 groups of Wales Units and 2 T-slotted plates permit alternating of patterns which practically eliminates press "down time."

Presses can be kept in almost continuous operation by using two Wales T-slotted Plates and two groups of Wales Type "B" Hole Punching Units. Thus, it is possible to have one pattern of Wales Units operating in press while another pattern is being set up on the second T-slotted plate away from the press. At the completion of the first run, the second set-up is moved onto the press bed ready to start operating. While this second set-up is operating, a third pattern can be set up with the first group of units and T-slotted plate. Transferring patterns in this way minimizes costly and inefficient press "down time."

Such economies are made possible by the following exclusive design features found only in Wales Units:—nothing attached to press ram . . . punch and die are always in perfect alignment which eliminates the usual slow, inaccurate punch and die aligning methods requiring hours of die-setting time . . . instant removing and resetting of units is possible on T-slotted plates to provide unlimited scattered and straight line patterns . . . self-contained punch and die holder provides independent mounting on T-slotted plates.

"There's Always Something New in the Wales Line."
Keep posted by writing for Bulletin B, TODAY.

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Specialists in Punching and Notching Equipment



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DUST COLLECTOR AND AIR FILTER

Designed for the removal and separating of the air from fine dust, arising from grinding, buffing and polishing wheels, sand belts, scrotch wheels and abrasive cutting wheels, or any other dust producing apparatus.

Made in three sizes to fit your individual machines. Economical in operation. Conserves heated air in cold weather. All units designed for air speed necessary to convey various material. A 3" static suction at 5000 ft. velocity.

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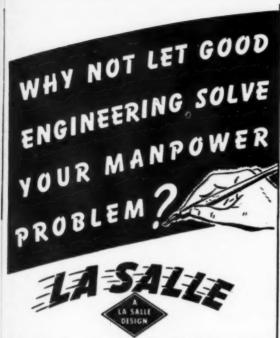
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- . A Positive Clean Air Filter.

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CENTRALIZED COOLANT CONTROL

Centralized coolant control promotes cleanliness and efficiency in the machine shop. Saves floor space; many more machine tools can be installed in the same area. Increases access to machines and promotes convenience of operation. Keeps floors clean; reduces danger of accidents due to oil spillage. Saves maintenance time; no large machine-cleaning crews required. Provides uniform quality of coolant. Permits easy sampling and bacteriological control. Frees your machine operators for greater production; no more "muck-raking" at the machines. Costs little more than oldstyle individual tanks and pumps. Write for new Bulletin A-504.

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SPEED-UP WAR PRODUCTION JOBS



Just wheel up to bench - - plug in - - go to work!

On jobs requiring a stroke of 7° or less, the AMMCO 7° PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet, as shown above at left, available as optional equipment, enables this shaper to be moved about the shop. It can be rolled from one job to another, and can be brought right up to machine or bench where man is working...Write today for specifications and prices.



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PRECISION BENCH LATH

A new stream-liner incorporating all the old Stark accuracy and stamina

THE first tool of its class with built-in Motor and speed changing mechanism (patented). Marvelously compact: nothing under the bench; no special bench or cabinet needed; even bolting down unnecessary.

Simply moving control lever to right engages the clutch, vertical position re-leases; moving to the left instantly brakes the moving spindle.

Standard (tool room) Model has timetried double taper spindle bearings 156 to 2200 r.p.m.—the best for sustained

High speed (manufacturing) Model fitted

High speed (manufacturing) Model fitted with best precision pre-loaded anti-friction bearings, 260 to 3500 r.p.m.

Both have 40 inch bed, 9 inch swing, 20 inches between centers: either ¾ or 1 inch collet capacity. Take regular STARK Attachments collets and chucks. This Stark (patented) built-in drive, integral with the Lathe itself, employs a ½ h.p. geared ball-bearing motor drive through a disc clutch, and through V belts to the headstock, giving any split speed at the turn of the small hand wheel in front of operator.

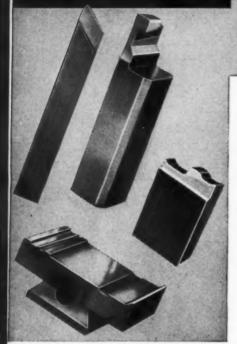
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ACCURATELY
MACHINED
SPECIAL
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The superior workmanship and greater accuracy of A.C.E. Special Cutting Tools insure faster cutting and longer useful life.

Note—We make only Specials. No tools for stock.

Send urgent inquiries for quick estimates.

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SPECIALIZING IN HIGH SPETO EUTTING TOOKS TO YOUR PAINTS

AS GOOD AS NEW!

Here's a bur with a history. Day after day, week after week, it has seen the toughest kind of usage cleaning up steel castings. But here it stands, now as good as new... ready to start life all over again. It has been restored and renewed... made as good as brand new by the Kellersex Resharpening Process.

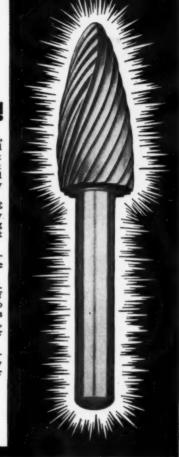
PRATT & WHITNEY CAN RESTORE YOUR BURS to their original cutting ability by this special process. It assures keen cutting edges, to precisely correct angles for deepest cuts with maximum chip clearance.

FASTER DELIVERY now possible. Enlarged facilities for resharpening burs assure prompt service without "waiting in line."

"DIAMOND BLUE" IF YOU WANT IT.

If the burs you send us for resharpening are of
high speed steel, we will gladly return them to
you in the famous PaW "Diamond Blue." This
means added heat treatment for longer life,
tougher performance. Simply specify it on your
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SEND US YOUR DULL BURS for a thorough application of that famous Pratt & Whitney Accuracy. Within a few days they'll be on their way back to you, good as new.





PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
KELLERFLEX SALES DEPARTMENT
WEST HARTFORD, CONN.

Don't Wait for Turret Lathes!



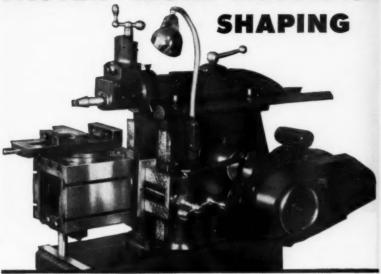
Convert your engine lathe into one now

- Speed production without waiting for new turret lathes. Simply attach Specialties Tail-Stock Turret, Cross-Slide Turret and Lathe Stop to your engine lathe. It's a time and moneysaving production team, Mail coupon for detailed information.
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- SPECIALTIES CROSS-SLIDE TURRET enables multiple machining operations on the same lathe, giving 4 working positions. No stops to change tools. Ties up only one lathe instead of four.
- SPECIALTIES TAIL-STOCK TUR-RET quickly converts engine lathe into 4-way turret lathe for endwork. Machining costs are cut sharply. Output is increased.

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FASTER-MORE ACCURATE



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Get these advantages at 1/3 less cost!

1. ACCURACY
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5. FLEXIBILITY

Regardless of speed or size of cut, this 8"-stroke shaper has no equal in performance. All working surfaces are precision-ground and handscraped to master gauges and all moving parts are fitted to closest tolerances to guarantee accurate work.

Extra-heavy ram and long ram-ways, plus helical-cut and precision-lapped gears help the Shape-Rite to give you the finest possible finish on all types of work—at *low* cost.

Sales Service MACHINE TOOL Company

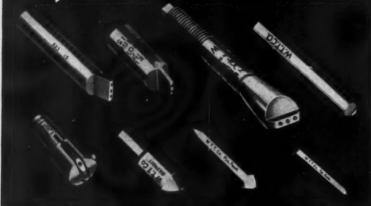
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DESIGNED TO GIVE BETTER PERFORMANCE AT LESS COST ON YOUR JOB!

The accuracy, precision, dependability and long life built into diamond tools by Wheel Trueing Tool Company are the result of 33 years' experience in designing, developing and manufacturing diamond tools of fine quality. These tools are the products of an organization of diamond engineers unexcelled in skill and experience-craftsmen who know grinding wheels and the application of diamonds and diamond tools to all types of production jobs.

It is no wonder that more and more production men interested in faster and more economical production are specifying diamond tools engineered to their jobs by Wheel Trueing Tool Company.

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STRAIGHT, FORM, THREAD AND RADIUS DRESSING: TURNING, BORING, GAGING AND CORE DRILLING

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DETROIT 6. MICH.



THOUSANDS OF VITAL CUTTING TOOLS QUICK!



For a variety of Special Cutting Tools to customers' prints, we can now approach mass production's speed.

This is due to special fixtures and equipment, many of our own design.

Note—We make no tools for stock. Send inquiry for prompt estimates. Bulletin on request.

Territories open for energetic agents.

Dependability in workmanship and delivery.

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WARREN INDUSTRIES



WARREN, MICHIGAN



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In many of America's fast producing industrial plants, American Air Filter equipment is protecting materials in process, reducing rejects, increasing worker efficiency and lowering maintenance costs.

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PREASONS WHY IT WILL PAY YOU TO

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The ALL-HYDRAULIC DUPLICATOR

- 1. FASTER PRODUCTION
- 2 FEWER REJECTS
- 3 HIGHLY SKILLED OPERATORS UNNECESSARY
- 4 EASILY ATTACHED TO ANY STANDARD MACHINE TOOL
- 5. EASILY DETACHED WHEN DIRECT MACHINING IS DESIRED
- 6. DEPENDABLE ALL HYDRAULIC OPERATION
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THE VISE WITH THE ONE PIEGE SOLID FORGED MOVABLE JAW.

A time tested Milling Vise that has performed most successfully for many years in the country's largest manufacturing plants.

It is designed and constructed for the production of interchangeable parts and for the present day speed, and feeds of modern milling machines. . . It is particularly adaptable to small arms milling where speed and precision are essential.

"The vise with the one piece solid forged movable jaw," gives greater strength and solidity during operations.

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SPECIAL MACHINERY CO.

MACHINE TOOL BLUE BOOK

63

SET-UP MAN THIS ALCOHOLLOW MILL HOLDER

Here is a tested and proven improvement in hollow mill holders over old fashioned types. You're interested in saving time these days; here's how the ALCO Hollow Mill Holder will do it Only one wrench is necessary to tighten the nut which holds the hollow mills. Position the mills on the work and tighten the studs on the flange of the holder and you are in absolute concentricity.

Better work complete finish in one operation comparable with box tool turning.

Longer life patented internal bearings ground entirely true with the shank bring the hollow mills to exact position so they cut on all lands assuring longer life to your tools.

WRITE FOR COMPLETE CATALOG.



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THE ALCO TOOL CO., 252 Birdseye St., Bridgeport, Conn.

Detroit Office: 908 Stephenson Building Chicago Office: 6219 S. Kenwood Ave., Telephone Hyde Park 6807



It takes a lot of muscle and coordination to ride a rough working, badly lubricated air tool. And that kind of ride takes you nowhere. You can tame it with the Norgren

LUBRO CONTROL UNIT

Make it operate with smooth flowing power of a thorobred! Keep it working that way by oiling the air that drives the tool... the one right method of lubrication. Also pretects against destructive corrosion when tool is idle.

CLEANING - COOLING - LUBRICATING

The Norgen LUBRO CONTROL UNIT combines air filter, pressure regulator, and lubricator. (Each can be used separately.) Sizes for every purpose.

Automatic; starts and stops with the tool. Sight feed; visible supply and service. Write to C. A. NORGREN CO., Denver, Colo., for latest catalog and price information.





Built to Take it!

BAT STATE



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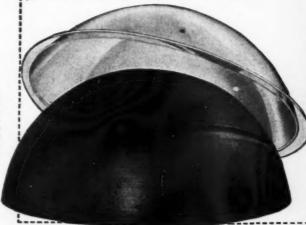
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BAY STATE

RBRRSIVE PRODUCTS CO., WESTBORO, MASS. U.S.A

MASONITE' DIE STOCK





This photograph, taken at Bell Aircraft Corporation, shows laminated Masonite Die Stock used as a mold for forming transparent plastics.

Widely popular for mating dies, forming blocks, templates, jigs and fixtures, Masonite Die Stock also is now being used for molding transparent plastics—to speed production of gun turrets and nose coverings in war planes.

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Masonite Die Stock is available in thicknesses of ¼ to 4 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further particulars, please mail coupon below.

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MASONITE CORPORATION

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WOODWARD GOVERNOR

Eliminates Bottleneck of Vital
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★ In the early phase of the war, Woodward Governor Company, manufacturers of hydraulic governors were called upon to deliver huge quantities of the intricate mechanisms that so efficiently control and automatically synchronize the performance of aircraft and marine engines. Manyobstacles in production had to be rapidly overcome. Speed and accuracy were vital factors. Among the production problems were several important screw machine parts, two of which are shown below. Here are the brief facts on how a Greenlee Six-Spindle Automatic was applied to improve quality and increase production . . . a typical example of one-run efficiency.



PRODUCTION RATE-148 Per Hr. Completed in One Run

★ This high-pressure valve was formerly blanked out at a rate of 30 pieces per hour—then completed on a turner lathe at a rate of 15 pieces per hour. With the job set up on the Greenlee, the 2nd run was eliminated and the hourly production rate was stepped up 9 times. Two large outside diameters at the end and a small diameter of 5/32* x 2*long, normally present a difficult screw machine operation, but the flexibility of the Greenlee, permissing a wide variety of setups, efficiently handled the job.

PRODUCTION RATE-115 Per Hr. Completed in One Run

★ This part, known as a double capacity pilot valve, also required two operations before it was put on the Greenlee. The first operation was handled at the rate of 12 pieces phour, and the second, on a lathe at the rate of 15 per hour. On the Greenlee, both operations were handled in one run and at a rate that was more than 7 times faster.

* Those facts and figures, contributed by Woodward Governor Company, speak highly of the efficiency of Greenlee Automatics, and indicate the apparent advantages of single-run operations on one machine. Perhaps they may suggest to other war plants ways and means of improving production facilities. Additional data, as well as production estimates, will be sent gladly. GREENLEE BROS. & CO., 1840 Mason Avenue Rockford, Illinois.

All Greenlee Users are invited to contribute data on practical methods considered of outstanding value in sour production, for pessible use in team.



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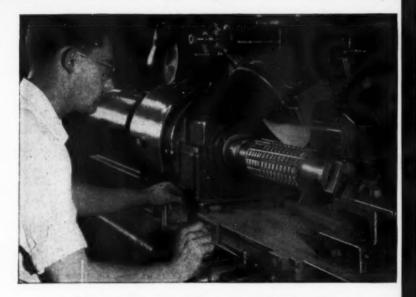
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SUMMEN



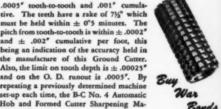
EXAMPLE OF ACCURACY...CLOSE LIMITS HELD ON BARBER-COLMAN NO. 4 HOB SHARPENING MACHINE

BREECH rings on certain important U. S. field guns are threaded with Barber-Colman Ground Thread Milling Cutters. One of these is shown here being sharpened on a B-C No. 4 Automatic Sharpening Machine. This description concerns not only the accuracy of this cutter, but the ability of the machine to maintain that accuracy on a cutter of such size (41/4" O.D. by 10.875" long). For instance, the spiral gash has a lead of 300.00", which must be held within .001" on the length of the cutter. The parallellsm of the cutter is held within

.0006". A deviation of lead or angle of gash will produce a taper condition which will change the form. The index error is held within

tive. The teeth have a rake of 71/2° which must be held within ± 0°5 minutes. The pitch from tooth-to-tooth is within ± .0002" and ± .002" cumulative per foot, this being an indication of the accuracy held in the manufacture of this Ground Cutter. Also, the limit on tooth depth is ± .00025" and on the O. D. runout is .0005". By repeating a previously determined machine set-up each time, the B-C No. 4 Automatic Hob and Formed Cutter Sharpening Machine will consistently duplicate such pre-

> cision accuracy as described here. For further information and application to your sharpening problems, write for Bulletin F 1011-2.





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A top cutting slightly small, will cut from one thousandth to three housandths of an inch larger (depending upon the size of the top), when reground a little more hooking on the cutting edges. sheaklike hard rubber, and fibre wear taps down quickly. Migh Speed steel tops last longer, especially those treated for tapping plastics. When threading soft materials (such as aluminum), taps should be advanced very carefully to avoid forn threads and bell-mouthed holes. Select the tap for the job; use-plenty of good lubrication; and keep the cutting edges of the tap sharp. Dull taps always our poor threads; term hard; and break long before they are wern out.

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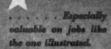
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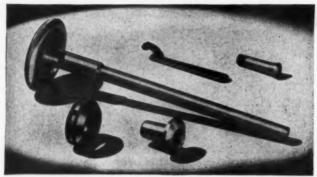
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1/16" to 9/16" 1/16" to 11/16" 1/16" to 3/4" 1/16" to 13	Capacity Round Collets	4.00 4.25
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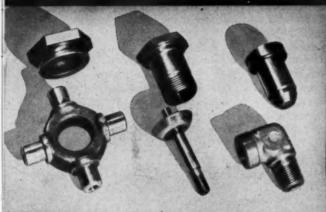
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EXTERNAL GRINDER MODEL B-6" x 12"

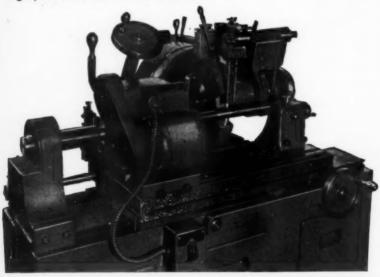
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Tool and Production executives from everywhere, from Maine to California, and from foreign countries have come to our plant to see this thread arinder in operation.

After seeing the accurate work it produces, the simple foolproof and ingenious design and the high rate of production of this thread grinder, they have ordered from one to several machines.

The accuracy of the GRINDALL thread grinder is unsurpassed.

It can be set up for any thread grinding job internal or external in ten minutes. It is simple in design and operation and anyone who can measure accurately can learn to operate the machine and be thoroughly familiar with it in a few hours.



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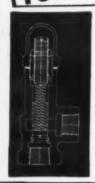
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October, 1943

MACHINE TOOL BLUE BOOK

06





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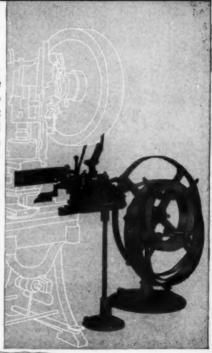
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thick of the production battle, performing with the same effectiveness that is helping Airacobras win air

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Want to speed up production of some particular war product, or see if you can save some metal somewhere along the production front?

Then come to Chicago the week of October 18 and attend the National Metal Congress and War Conference Display. Devoted to increased production of war products, to conservation of materials, and to post-war planning, this great event of the metal industry will help you solve many problems.

We've a big production job still ahead of us. We need all the information and new developments that will improve the efficiency of armament production. So mark your calendar now — and plan to be in Chicago when the metal industry meets the week of October 18.

THE PALMER HOUSE Chicago - October 18 thru 22

NATIONAL METAL CONGRESS and WAR CONFERENCE DISPLAY Thousands of visitors to the Metal Congress will look to the hundreds of War Conference Displays for new products, new processes, and new developments, 65% of the available display space has been reserved in the first four weeks following announcement of this 25th Annual Conference Display.

But excellent display room locations are still available. For complete information, write or wire the American Society, for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio, Phone: ENdicott 1910.

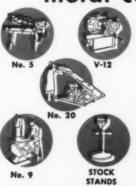


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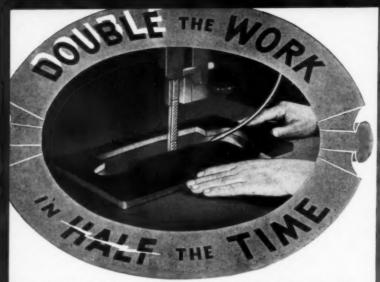
HE Wells No. 8 is an all-purpose metal cutting saw, fast for a saw of its size. It can be used on production, in stores, toolroom, or on maintenance to cut most metals in most shapes. Easily portable, it can be moved to the job.

The Wells No. 8 cuts fast because it cuts continuously. Quick acting swivel vice affords rapid set-up and change-over... Gravity feed and automatic motor shut-off permits one operator to run 2 to 4 Wells Band Saws simultaneously... Three speeds, insure efficient cutting.

Ruggedly constructed, with a minimum of moving parts, Wells No. 8 offers a long life of trouble-free service. You will find a Wells saw to suit nearly every application. Ask your Mill Supply dealer to give you a demonstration. Quick deliveries are assured.

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BANDSAWS



sed to be that a certain job took 8 hours to hand file. Later, a jig file t the time to 5 hours. Now the same work is done in 1 hour with a O-ALL Band File.

And here's why: 50 to 200 feet of file pass over the work every minute a continuous file traveling evenly in one direction, with no back oking.

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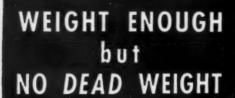
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-ALL Offices in 25 cities, with a staff of trained ineers to give you quick service on DO-ALL nd Files and Saws, Contour Machines, Gage cks and Surface Grinders.







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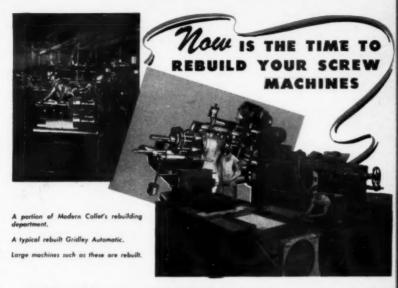
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BAND SAWS and 16" models ed range from 61 to

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At speeds as great, and feeds as fast, as modern tools will withstand, Acme-Gridley Automatics are turning out parts by the hundreds of millions for America's war machine.

When their war job is done, these 4, 6 and 8 spindle bar automatics will be ready to carry on for peace time production—most of them with a simple change of tooling.

They will do their full share in building the better, more efficient and lower-priced goods we shall one day begin to create for ourselves, and for all the world. Northern Ordnance Incorporated's batteries of Acme-Gridley Bar Automatics are working on high pressure fittings that require the utmost precision.

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Machines that are Sturdy and Adaptable - -Standing up under severe conditions - - -Producing more for every unit of power - - - -

Series 20 WYCO 1/3 and 1/2 h.p. Tool Room grinders are 3-Speed Machines for Production Tool. Die and Pattern Shops. Also for smooth vibrationless grinding and polishing on stainless steel and other alloy welds.

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The illustration shows a machine equipped with Detroit Broaches, in which the broaching operation consists only of the cutting of two flat parallel surfaces. Parts can be laid in position without clamping. The fixture and broaches are very simple and inexpensive. Used on a machine of this type the total investment is well within the budget of any manufacturer. Equipment such as this is adaptable to a wide range of broaching operations that make production simpler and more economical in the largest as well as the smallest shops.

Don't be hesitant in investigating the possibilities of broaching parts which you manufacture. The suggestions and recommendations of the Detroit Broach engineers are offered to

you without obligation. It's more than possible that they can show you how broaching will overcome many production weaknesses. Why not write TODA?

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BERKELEY POWER DRIVES

 Rugged, welded steel mounting brackets. . . Individually designed for your equipment, regardless of age or type.

Engineered by power drive pioneers to convert your sluggish line shaft equipment into speedy modern machines, suitable for the latest cutting tools. Prompt estimates, deliveries and individual attention our specialty.

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FOR TAPPING TWO HOLES in one piece, a Haskins Two Spindle Tapper—with Piece Part Control—substantially speeds up production.

In the operation above (aluminum fuse bodies), two holes of different sizes are tapped by one operator, on one machine.

Parts are placed in the fixture, pressed against pins operating micro switches and—air does the rest. With both hands free, the operator can handle parts faster—much faster. Everything else is automatic.

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For nearly a quarter of a century the name "Progressive" has been a buy-word for end mills of quality and dependability. Now the Progressive line of mills is being manufactured by the Siewek Tool Division of Domestic Industries, Inc. There has been no change in the high character of the product, no change in the family of skilled workers, many of whom have in the family of skilled workers. change in the high character of the product, no change in the family of skilled workers, many of whom have been with the company almost from its inception. The been with the company almost from its inception. The only change between Progressive end mills of today and only change between Progressive end mills of today and those of yesteryear has been the addition of the wider those of yesteryear has been the addition of the wider resources of Domestic Industries, Inc.,—an addition which brings added manufacturing facilities and improved customer service.

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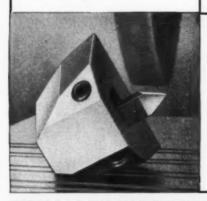
NEW CLARK THREAD TOOL GRINDING FIXTURE

CLOSE TOLERANCES

One fixture for grinding both National 60° and Acme 29° thread tool bits, insuring close tolerances. Saves vital materials and time. Accurate, uniform cuts. For use on any surface or cutter grinder.

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Every compound angle is predetermined to provide correct thread angle and clearance—no guesswork. All bits may be ground with or without rake on cutting face. Ideal for Carbide tips, all bits.



2 PRECISION MODELS

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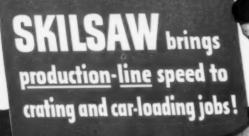
WRITE FOR BULLETIN No. 10

MODELS A & B ALSO GRIND BITS FOR USE IN ARMSTRONG TOOL HOLDERS

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Whatever the sawing jobs in your plant . . . in shipping, receiving, maintenance or production departments . . . SKILSAW will do them faster, better and with fewer men. Ask your distributor to prove it with a demonstration of SKILSAW NOW!

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MAKE AMERICA'S HANDS MORE PRODUCTI

Jeatured In This Issue

TRENDS on the Production Front will be a regular monthly feature, discussing innovations and late developments. First installment will be found on page

PRODUCTION PLANNING is the topic of Mr. Mottershead's 14th contribution to the Foremanship Forum. See page

"LET'S TALK SHOP" — the regular shop hints section—page..........225

TAX DEDUCTIONS and the need for systematizing recordings are discussed by Arthur Roberts on page......248

WHAT'S NEW in Metalworking—page 254

AVAILABLE LITERATURE—page..344
MECHANICS THRU THE AGES—page

FlexoiD Safety MATS for Foot Comfort



CHECK OVER THESE FEATURES --

Lays firmly on uneven floors.
No foot slipping even when oily.
Easy to clean or wash,
Keeps feet dry and clean,
Will not slip on floor,
Eliminates "leg fatigue,"
Easily rolled up for carrying,
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Drain slots permit circulation of
air and drainage,
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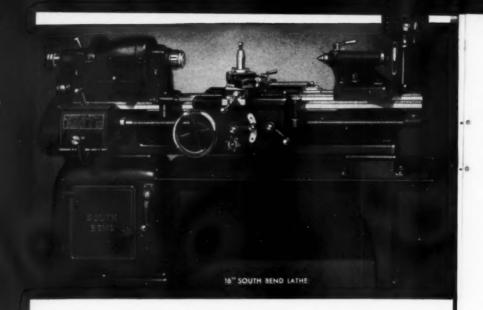
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SPECIFICATIONS

Swing over bed . 16%"
Distance between centers. 33%"
Maximum collet capacity . 1"
Thread cutting feeds (48) . 4 to 224 per inch
Spindle Speeds (8) . 2 to 725 r.p.m.
Power longitudinal and cross

feeds 48



War production demands uniform accuracy. Loss of time or the waste of scarce strategic materials because of variations in machining cannot be tolerated. There is no place in our war production plan for equipment that cannot be relied upon to maintain required tolerances.

Sound design and careful workmanship give South Bend Lathes the dependable precision that assures uniform accuracy and speeds production on the most exacting machine operations.

South Bend Engine Lathes and Toolroom Lathes are made with 9", 10", 13", 14½", and 16" swings. The turret lathes are made with 9" and 10" swings. Write for Catalog 100-C in which they are all described.

TRAINING HELPS—Sound films, books, wall charts and bulletins are available for training lathe operators. Write for Bulletin 21-C.

SOUTH BEND LATHE WORKS
LATHE BUILDERS FOR 36 YEARS . SOUTH BEND 22, INDIANA

As The Editor Sees It



FIRE always has been an arch-enemy of industry. But it has been a menace chiefly because we are so careless with it.

Simple precautions, if we made a regular habit of them, would save thousands of lives, millions of dollars worth of property and millions of hours of manpower every year.

This waste is all the more tragic now when our full resources, human and material, are strained in a world-wide struggle to preserve man's freedom.

Carelessness with so dangerous an agent of destruction as the match you throw away — one of half a million matches struck every minute — can be tolerated no more than deliberate sabotage by an enemy agent.

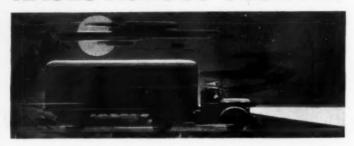
Most of the obvious precautions against fire come under the head of industrial "good housekeeping". A first step is cleaning up premises. Rubbish makes convenient fuel for flames.

Second only to cleanliness is frequent inspection of fire extinguishers, sand and water pails, sprinkler systems, hose connections and hose lines.

The important thing is to guard against every known fire hazard. October 3-9 has been set aside as National Fire Prevention Week. But why not take the necessary precautions against fire TODAY . . . and EVERY DAY?

Wesley G. Paulson

RYERSON STEEL RACES ACROSS COUNTRY



10 Tons of Sheets Delivered 700 Miles In 30 Hours 20 Minutes

It is 4:10 P.M.—a truck with ten tons of sheet steel pulls away from the Ryerson Chicago Plant. In a Western war factory 700 miles away, important production for Army invasion equipment is waiting.

Flying the ODT "Emergency Flags" with special permission to travel at 60 miles an hour the shipment arrives next day at 11:30 P.M.—just 30 hours and 20 minutes after the order was dispatched.

Two significant facts: The sheets so urgently needed were in Ryerson stock for immediate shipment. And Ryerson facilities and service measured up to the emergency.

Unusual? No! This order is only one of many Ryerson emergency shipments that are preventing production shut-downs in these critical times.

Next time you need steel in a hurry, whether it is sheets, plates, bars or beams—we urge you to call the nearest of the ten Ryerson Steel-Service plants. Whatever you require, you'll get prompt, effective cooperation.

Joseph T. Ryerson & Son, Inc., Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE



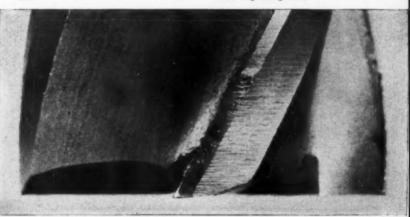
MORE extensive damage is done to tools by galling of their surfaces than by any other kind of wear. Operaton in contact with unusual quantities of foreign abrasive particles is excepted, of course. Such galling is the result of the welding together of minute spots on the mating rubbing surfaces. The frequency of the occurrence of these welds, and the destruction caused thereby, seems to be underestimated.

For welding between two metallic surfaces to happen, it is only necessary that they be absolutely clean and that the clean surfaces come into actual metal-to-metal contact. It seems unlikely that heat is required, altho it usually is present and does greatly increase the amount of damage done. Heat causes greater pressure between the surfaces because of expansion. It drives away the lubricating

*Chief Metallurgist, International Machine Tool Corp., Foster Div., Elkhart, Ind. film and lowers the physical properties of the metals. Softening by heat results in increased area of true contact by easier deformation of the surface irregularities under pressure; and the effects of that increased area of welding will be shown to be much more detrimental because of greater ductility due to heat. Nevertheless, appreciable heat is not believed necessary to the welding together of metallic surfaces.

Absolute cleanliness is but a momentary condition. Any non-metallic substance whatever, renders the surfaces unclean from the welding standpoint. Nearly all metal surfaces, for instance, instantly begin to oxidize on contact with the air. Such oxide films, however thin they may be, act as contaminants to prevent welding. Any film, whatever its origin may be, must be wiped away before this action

The illustration below shows magnified end section of an End Mill which has galled because of roughness of the cutting edges and annealing of the surfaces as a result of grinding heat.



can proceed. It is particularly pertinent to point out that oil is usually regarded purely as a lubricant, but another very important function is to render the surface unclean from a welding standpoint. This is also true in regard to coolants and cutting fluids.



Drill which has galled badly because its lands were annealed to increased ductility as a result of improper grinding.

While surface cleanliness is of but fleeting duration, the normal rubbing together of tool and chip, or of shaft and its bearing, are ideal movements for the wiping away of surface contaminants. We can be sure that when two metals are rubbed together, under sufficient pressure to wipe away all surface films, that actual metalic contact ensues, with welding as the result. Fortunately, such contact seldom includes more than a minute area. Nevertheless, just as true a weld is formed as if done by the conventional methods, and it will have very detrimental results.

In the use of most tools (as well as shafts and all other rubbing surfaces) four factors, other than pressure and speed, largely determine the probability of welding and the extent of damage that will be done. They are:

1-The type of lubricant or cutting compound in use.

2-The kinds of metal composing the rubbing surfaces.

3—The ductility and softness of those metals.

4-The geometry of the surfaces.

The scope of this article will not allow more than a very brief discussion of lubricants and cutting compounds. However, it is well known that considerable differences exist in the "oiliness" and "wetting capacity" of various mineral. vegetable, and animal oil bases. Obviously, an oil or compound that will spread rapidly and adhere tenaciously to tool and chip surfaces, will contaminate them against welding most efficiently. Addition of chemically active substances to the coolant or lubricant will often result in improved cutting action and longer tool life. Sulphur, for instance, will react with the tool and chip surfaces, producing thin but adherent films which reduce welding to a considerable degree.

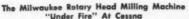
Without question, scientific selection of tool lubricants and coolants is an extremely important item and one that will pay worthwhile dividends. The more completely any kind of contaminating film is interposed between tool surface and chips, or between a shaft and its bearing, the less will be the probability of welding.

While some degree of affinity, or capacity to weld, exists between all metallic tools and the metals machined or formed, there is a considerable variation in that respect. A steel chip, for instance, will weld to a high speed tool bit much more readily than a brass chip; and a steel cartridge shell will weld to the steel punch more readily than a brass shell. Decreased tool life and poorer finish must be expected when the tool surface has a comparatively high degree of affinity for the metal processed.

The extreme hardness of carbide tool tips, particularly at elevated tempera-

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Since purchasing their first Milwaukee Rotary Head Milling Machine, Cessna Aircraft has milled hundreds of complicated blanking dies of geometrical form. Furthermore, they milled the punches to fit these dies with .001" clearance in between without resorting to hand fitting of any kind.

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Rotary Head Milling Machine Autometric lig Borers Center Scope

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Milwaukee Face Mill Grinder Milwaukee Midgetmill Milwaukee Speedmill tures, is undoubtedly a major reason for their capacity to remove metal at high speeds and with reduced tool wear. Yet is seems logical to believe that much of their efficiency can be ascribed to their low welding affinity for the metals machined. Because this tool material is essentially a carbide instead of a metal, such metallic affinity is greatly reduced.

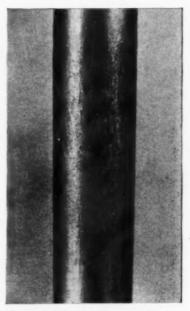
Unfortunately, many tools, because of shape, necessity for greater strength or toughness or consideration of cost, must be made of steel. However, even in these cases, there is a remedy for welding that is gradually gaining the recognition I believe it should receive. That remedy is hard chromium plating. Many of the disappointments experienced with chrome plating have been due to its deposition on too rough surfaces and in too great thicknesses. Plating technique also has been faulty in many cases.

Here also, much of the success of properly applied chrome plating is probably due to its extreme hardness and very low ductlity. Yet its very low tendency to weld should not be overlooked. This appears to be just as valuable a feature as its hardness. While its application to smooth cutting tool surfaces would seem to offer the greatest advantages, there are few rubbing surfaces of any description that would not be benefitted thereby, even shaft bearings, for example.

The extent of damage by welding is greatly affected by the softness and ductility of the tool surface. As the individual weld takes place, a certain usually minute area of the two surfaces is joined together. That extent of area will be greater if the tool or bearing surface is soft enough, perhaps thru heating, to deform under pressure of the mating surfaces.

Thus the area of the weld is governed, partially, by the softness of the surfaces. Welds are almost invariably broken just as rapidly as they are made. When continued movement breaks them a part, metal is torn from one surface to become a ragged defect on the other. This transferred metal has thickness as well as area; welding is a three dimensional action. The depth to which the defect is torn out depends upon the ductility of

the metal from which it came. If that metal is very hard and has very little ductility, it will flake off in exceedingly thin particles. If it has considerable ductility, it will tear out to a correspondingly greater depth. Thus soft and ductile metals, not only tend to weld over larger areas, but to tear out to greater depths. Hard and brittle metals are harmed comparatively little by welding.



Cartridge punch which has welded to the shell metal, due to inaccurate surface geometry and insufficient hardness.

This considerable variation in the extent of welding, due to difference in ductility, has a very practical and important bearing on the life and performance of tools. Consider the serious effects of just a few points variation in Rockwell hardness of a high speed steel lathe turning tool. It is well known that a tool having a hardness of 58 or even 60 Rockwell C, does not stand up satisfactorily, but one of 65 or 66 is quite efficient. The differ-



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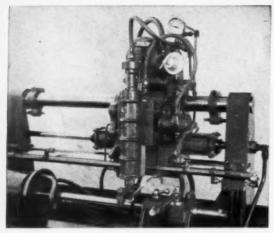
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Superfinishing a shaft on a 4x18" general purpose machine. Note the large area of bonded abrasive contact. All waviness, such as chatter, flats and feed marks are removed.

ence in capacity to remove a given quantity of steel chips is not due any difference in resistance to penetration of the tool surface by the chip or to pure abrasion. If it were, a cold chisel of far less hardness would remove no metal at all. The real difference lies in the slightly greater ductility found in the tool surface of 58 Rockwell and the influence of that condition on the extent of damage to the tool face by welding. Later, it will be shown that grinding ridges also promote galling.

Because the chip is split from the work some distance in advance of the tool edge, it does not contact that edge at all, but impinges on the upper face of the lathe tool at some distance from the edge. As the cut is started, the chip begins to rub continuously upon the described location on the tool face. Soon, all oxidation or other film is completely wiped from the tool surface, and it is impossible to replace it adequately with any type of coolant. Clean metal-to-metal contact between the chip and the high speed steel is established, and welding begins.

The first result of welding is the tearing out of particles of the chip, to become defects welded on the tool surface. Since the chip contact is at some little distance from the cutting edge, and the weld is at the same point, there is a space within which a "built-up-edge" forms on the very point of the tool. Very soon this

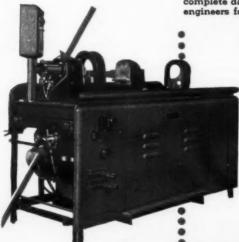
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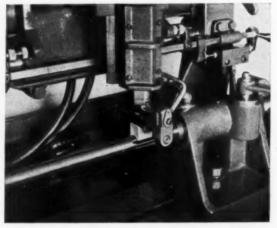


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build-up becomes large enough so that the pressure of the chip breaks the weld lose, and tears out with it a minute section of the tool face itself. Such welds are continuously being formed and broken again and again as the chip passes over the tool face. tility does exist between tools of the described variation in hardnesses can be proved readily with a sharp file. One of 58 or 60 Rockwell can be cut with the file, but one of 65 or 66 hardness is completely resistant to it.



Superfinishing a reamer on a 4x18" general purpose machine. Note large area of the working face of the honded abrasive.

If the tool is only 58 or 60 Rockwell, the particles torn from the tool face will have an appreciable depth, because it does have some ductility. Such a tool will crater much too rapidly for efficient production. On the other hand, particles torn from a tool face of 64 or 65 hardness will be mere tiny, thin flakes, and many hours will pass before cratering becomes serious. That such a difference in duc-

All types of cutting tools, as well as those for a variety of other uses, will be found equally critical in their surface hardness requirements. If they are allowed to drop below a certain hardness, trouble immediately starts from welding. Unfortunately, many tools which have been very skillfully hardened are annealed or "burned" in grinding. Since it is only the very outside dimension of the



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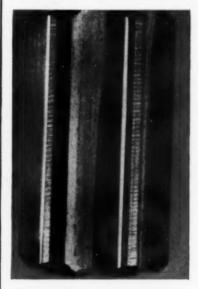
Illustrated in Catalog No. 430

SYNTRON CO.

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tool that contacts the work, it may as well have been hardened improperly in the first place. While the tool surface eventually may wear down to expose its real hardness, serious welding or galling meanwhile will have roughened it to an unsatisfactory degree. The only way to maintain control over tool surface conditions is to make them both smooth and truly hard before they are ever put to use. Chrome plating such smooth sur-



These gleaming cutting surfaces are superfinished and chrome plated for long life and maximum cutting performance.

faces will often make them still more efficient.

Smooth finishing of tool surfaces is a factor that is just beginning to receive the attention it has long needed. The war effort, and the critical shortage of tool steels have made it imperative that every expedient be employed to increase tool life. While it cannot be termed a new discovery, it surely can be said that one of the outstanding recommendations resulting from the demands of the war



The bird that is its own mother!

THE FABLED PHOENIX lives for 500 years. At the end of that time, it builds itself a nest in the branches of an oak or the loop of a pain tree. After the funeral pyre is complete with cinnamon, spikenard and myrth, the phoenix sets the nest on fire and burns itself alive.

From its body, or its cahes, a young phoenix issues forth, destined to live another 500 years. When it is strong enough, it carries the nest—its own cradle and its parent's coffin—to the temple of the Sun.

We think the modern parallel to this story is even more interesting, because it's true! Did you know that machine tools are the mothers of machines? They are the only things made by man that can reproduce the matter. And it's fortunate for us they can, because machine tools are a measure of the degree of civilization of a country.

Machine tools are the foundation of all modern industrial production. They are not only essential for the manufacture of every class of engine and kind of mechanism, but every manufactured product—metal goods, textiles, foodstuffs, scientific instruments, building materials—all must be built on machine tools or on a machine constructed with their help!

In the post-war era, Cone Multiple Spindle Automatic Lathes will be even more essential than they are now. Their unique advantages of timentalized control will be averaged by the property of the property and before.

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effort has been to make tool surfaces smooth. Increases in life as high as 20 to 1 have been cited in government reports.

When the conditions prevailing on the lathe tool face during its use are visualized in a sufficiently minute manner, the success realized from smooth finishing is entirely logical. Common grinding methods produce a coarse surface containing comparatively few, but high, ridges. The pressure of the chips is much higher on the peaks of these ridges than elsewhere. Further, it is impossible to maintain a film of coolant on those points to contaminate them and prevent welding to the chips. If, as often is the case, the heat of grinding has reduced the hardness of these ridges, even a very few points Rockwell, the tendency toward welding is still further increased.



The superfinished-chrome plated surfaces of these form tools mirror the striped cloth on which they were photographed.

The progress of welding action, started on rough grinding ridges, certainly does not tend toward greater smoothness. Instead, the condition becomes at ead ily worse, and serious cratering soon follows. If a smoothness of 1 to 3 micro-inches (r m s) is produced on the tool face by a means which will remove any annealed layer, the operation of the tool will be greatly improved for several reasons. The chip pressure will be uniformly distributed over the entire working surface. The



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coolant will be more evenly distributed. Such welding as is not then prevented will be held to a minimum of destructive effect by a real hardness of the surface.

Schematic illustrations of the lathe tool cutting edges have been shown with the argument that rough tool surfaces are inefficient because the coarse ridge tips break off along the extreme cutting edge. resulting in a negative angle of clearance. I doubt that such a condition is important for two reasons:-First, the illustrations show the grinding ridge to be very much sharper than it actually is. Actually, it is several times as wide as it is high, and its included angle is thus quite obtuse. It does not seem reasonable that its sharpness is sufficient to render it weak enough to snap off readily. Second, the chip pressure does not impinge directly upon the extreme cutting edge, but away from it an appreciable distance. I believe that very smooth and truly hard tool surfaces are more efficient, simply because welding is reduced by uniform distribution of chip pressure and coolant over a surface of such low ductility that it cannot be scuffed into greater area of contact with the chip, and allow particles to be torn out to appreciable depths.

Lathe tools, with cutting angles ground to shape, can be smooth-finished by the use of special fine grit wheels or by hand stoning. Where wheels are used, it is extremely important that the grinding be done without the production of sufficient heat to lower surface hardness. Where the entire cutting surface of the tool is flat, another process can be employed, which will provide maximum smoothness without any possibility of annealing the surface. Not only will grinding roughness be removed but any burning caused by that grinding. That process is Superfinish. By its use, surfaces of less than 3 micro-inches (r m s) are easily obtained, and the true hardness of the tool will be realized on its extreme outside working surface.

In Superfinishing, a very fine grit (usually 600) bonded abrasive is employed in cup shape on flat surfaces, and in stick shape on cylindrical surfaces. Its contact with the surface being improved is over a

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considerable AREA instead of a line contact as in grinding. The result is the complete removal, not only of the grinding ridges but of other forms of waviness such as chatter, flats, and feed marks, Very light pressure, low work and abrasive speeds, together with an adequate supply of stone lubricant, result in the production of no appreciable heat to anneal the tool surface. Yet so many very fine grits are in action over the area of contact that smoothness as well as greatly improved surface shape are obtained in a remarkably short time. Both single purpose, high production machines and those for tool room use are available for the application of the Superfinishing process to flat, spherical, and cylindrical surfaces.

Lathe tools are by no means the only tools that are improved by smoothness and proper surface hardness. Reamers, for example, are intended to produce the largest possible number of smooth holes of one definite size. If the lands are rough and/or have been even slightly burned in grinding, the metal being reamed will weld to them, thus building up ragged defects on them. Rough, torn holes and short life of the reamer is the inevitable result. Lands of twist drills are subject to exactly the same action.

Smoother lands on either of these tools can be produced by Superfinish than by any other commercial process, together with complete removal of any burning by grinding and improvement in straightness of the diameters. This method is now employed by several of the largest drill and reamer manufacturers in the country.

Cartridge punches are timely representatives of tools that must be exceedingly smooth and cannot have any surface waviness. Even the punches be smooth, waviness or bulges will be pressed into the cartridge shells. When the punches are withdrawn, these bulges must be pulled thru the shell metal, resulting in extreme pressure at such points. Wiping away of the punch lubricant, with clean metallic contact and welding, is almost sure to occur. The mild action and area of contact of the Superfinishing abrasive has been proved most efficient for the improvement of punch surfaces. Many thousands of them have been finished by that process.

Since the use of any and all metal working tools results in some degree of metallic pressure, this same condition of surface damage by welding easily can be present in any metal working process. Uneven surfaces should not be tolerated, because the working pressure on the crests of ridges and waviness is far above the average, and provides too great possibility of true metal to metal contact. Extreme care must be taken that the very outside dimensions of tools really possess the desirable degree of hardness instead of annealed surfaces, resulting from the heat of grinding.

Not alone in the use of tools, but in every type and kind of mechanical assembly should these same considerations be kept in mind. If we can prevent welding and the entrance of foreign abrasive particles between the rubbing surfaces we shall have conquered by far the largest possibilities of wear. The Superfinishing process has proved the most efficient for the removal of ridges, waviness and annealed surfaces, which are largely responsible for welding.



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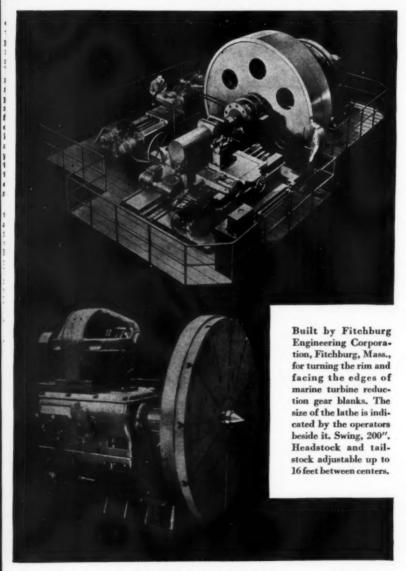
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Few manufacturers require equipment of this type. However, every user of lathes must be sure that his equipment has the stability, the toughness, the rigidity and the power, combined with unfailing accuracy in performance to carry out the requirements of his work.

The selection of Monarch lathes, for a wide variety of work in war production, was based upon their proved productivity in peacetime. These same qualities are being maintained and amplified, today.

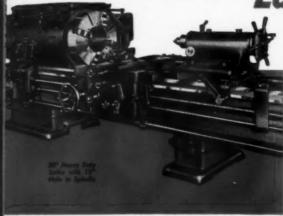
Manufacturers planning their peacetime operations are invited to consult with Monarch engineers, on their lathe requirements.



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Lehmann

N some circles, the diamond is again advertised as a new tool. But I believe, basing my statement on careful historical studies, that the diamond in nearly every application is a very old tool. Knowledge of diamond tools, for one reason or another undoubtedly has lapsed during certain periods. Consequently diamond tools had to be re-invented repeatedly to meet urgent production problems, no other tool or material could satisfy. It is well known, for instance that the old Egyptians used sawing blades and stone drills of metal, provided with hard stone cutting edges, an art re-invented about the middle of the last century (*1 and 2) Greek and Roman gem cutters used diamond engraving tools, and besides engraving points, probably rotating tools prepared with diamond dust. These probably were not used again in comparatively modern times before the 16th century. Dies of diamonds and other hard stones may have been used long before they were first recorded and patented. (*3)

The shaped diamond tool has been considered as an important achievement of the last 20 years, but it can be demonstrated that tools very similar to our modern types were being used by London engineers at the beginning of last century. (*4). Toward the middle of the last century, diamond tools were employed for cutting hardened steels but at the present time this practice is not considered economical. This brief review shows how closely modern technique is connected with that of older times, and not only in this highly specialized field.

Shaped Diamond Tools are indispensable in the production of aero and automobile engines, and for the machining of softer metals. Hardened steel parts generally are ground, with but a few exceptions. However, in the truing and reconditioning of grinding wheels, the diamond remains unequalled for restoring the true geometrical form of the grinding wheel, a cylinder. Adverse experiences have

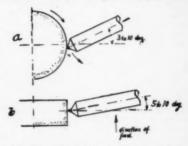


Fig. 1-a andb—Truing the periphery of a grinding wheel; (a) tool perpendicular to face, but inclined in side view and (b) tool inclined to face, but horizontal in elevation.

led leading grinding wheel manufacturers to a new recommendation:— (see Figures 1 and 2) i.e., to adjust the point of the diamond exactly on centerline of grinding wheel and workpiece, With O1 centre of grinding wheel and O2 centre of workpiece, the diamond point has to be adjusted with its point at P, on the connecting line O1O2. (*5) In order that the point should not "hook in" it is inclined under a trailing angle between five to 15 degrees. The diamond insert should be turned frequently into another position (Figures 3a and b) and combined

^{*}Consulting Editor, Industrial Diamond Review. London.

with the described inclination, the diamond point retains its cup-shape form. Figures 4a and 4b show a truing device for a wheel of a surface grinder, whereby the diamond attacks the wheel under a trailing angle and the holder can be rocked over so as to be used for side and periphery.

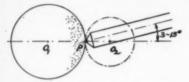


Fig. 2-Truing of grinding wheels according to newest recommendations.

In recent years, cluster type truing diamonds have been developed by numerous firms and are preferred for many uses. For the use and maintenance of the cluster type of diamond holders (small diamonds set in a metal matrix) these recommendations (5a) are made:-The axis of the shank should be set on center line of the wheel or 1/32" (0.8mm) below center and inclined under a trailing angle of 10 to 15 degrees. The cuts taken should be light and not over 0.002" (0.05mm) per pass. The traversing speed for roughing should be 18 to 30" per minute (0.45 to 0.75 mm/minute) and for finishing six to 15" per minute (0.15 to 0.375 mm/minute). The holder should be turned frequently, at east a quarter of a turn every working day.

When the diamonds are worn down level with the matrix, it is recommended to roll them up and down from side to side against the face of a 60 to 80 grit soft grade aluminum oxide wheel until the diamonds become exposed again.

For the truing of thread grinding wheels, several methods (*6) are in use and most of them utilize shaped diamond points. Well known makes of grinding machines use cube shaped, V-shaped and conical diamond points. In order to reduce the diamond consumption for multiribbed wheels down to certain pitches, crusher rollers (*7) are used, but these also need truing diamonds for the grinding wheels by which they are produced.

Shaped diamond tools (*7a) are used to provide cutting edges for high grade turning, boring and milling. The use of the diamond recommends itself only for the last finishing operations and generally only minute chips are taken. This finishing process is further distinguished by high peripheral speeds and very fine feeds, necessitating the use of high class machinery. Most other tool points would, under such conditions, become blunted in short order, but the diamond can stand these stresses on the foremost point of its cutting edge, owing to its intrinsic hardness.

The main stress on cutting edges usually is caused by friction and an affinity between tool and work material. The diamond, owing to its dense structure. causes apparently less friction than other materials and has no affinity for metals. Consequently no momentary welding between work and tool tip can occur. However, in the case of minute cutting edges and very small chip cross-sections, high stresses per unit of area are set up. Measurements recently made by means of sensitive instruments showed that the main cutting force was about 1-lb for a chip cross-section of 0.004" by 0.002", resulting in a specific pressure of about 125,000 lbs/sq in or 57 tons/sq in.

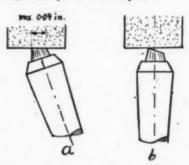


Fig. 3-a and b-Readjustment of a diamond tool towards the surface of the grinding wheel.

In (a) the point of the diamond is worn and the holder has to be readjusted as shown in b.

Owing to these relatively high forces, the diamond has to be selected in such a



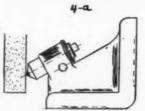
This milling machine will perform and accurately produce at all speeds and feeds to the full capacity of the motor installed. By performing the above mentioned operations the No. 40 KNIGHT MILLER saves valuable hours of down-time on many jobs. The Special swivel and tilting table features save the use of angle plates, cutters and special fixtures.

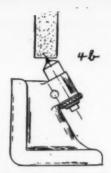
The No. 40 KNIGHT MILLER has a wide range of capacity fitting it for many jobs and uses. There are 16 different spindle speeds, with reverse provided, also 16 table feeds.



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Fig. 4a and b-Truing the wheel of a surface grinder.





way that the cutting pressure acts almost under right-angles to any cleavage direction in the stone. This is effected in high grade diamond tools, which are ground according to structure. In such cases, an easy chipping of the diamond edge is avoided, which is observable often on inferior diamond tools that are more or less ground according to their casual shape. Primarily, the stone should be free from flaws, inclusions, bubbles, fissures, feathers etc. Preferably, before starting the expensive polishing the rough stones should be investigated for internal strain by polarized light, and later on before using the stone after setting. These materials and groups of materials can be machined with shaped diamond tools to decided advantage:

(a) Metallic materials— Lightmetal alloys:—aluminum, magnesium alloys, duralumin, alusil etc. Soft metals:—copper and brass. Bearing metals:—babbit metal, bronze

and lead bronze.

Precious metals:—gold, silver and platinum.

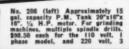
Cast-Iron and Steel (only in special

Cast-Iron and Steel (only in special cases).

(b) Non-metallic Materials— Phenoiformaldehyde resins. Bakelite with cotton or paper fillers. Cellulose acetate resins. Ebonite. Artificial carbon.

The shaped diamond tool requires another form of cutting edge and this is best demonstrated by means of a diagram (Fig. 5). This shows suitable cutting edges for the machining of aluminum, made of (a) High Speed Steel, (b) Sintered carbide and (c) Diamond Tool. In all these cases, the front-adjusting angle was (Kappa) Ki=45 degrees; the side clearance angle, (alpha) a=8 degrees and the front clearance angle a' about 11 degrees. (There is a distinct relation between side clearance angle and front clearance angle and front clearance angle for a given adjusting angle sine a' = sine a'cos Ki which is fre-

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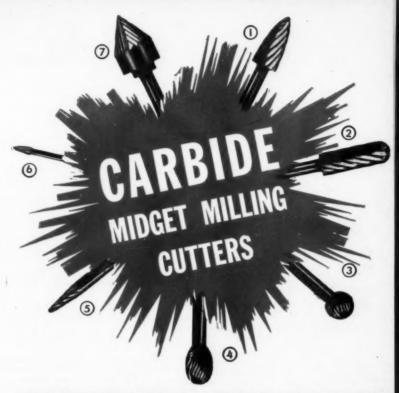


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phase model. \$112.00 for the 550 volt. 3 phase model. No. 1-s (right) Approximately 7 gal. capacity P.M. 16"x16"x 11" tank. 1/4 H.P. motor. For Milling and Screw Machines, Lathes, etc. \$98.50 each for 110 volt. 1 phase model. 220 volt. 3 phase model. 550 volt. 3 phase model \$105.50



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Shown here are a few of the many shapes and sizes available.

		414145141
No.	Diameter of Cutting Portion	Length of Cutting Portion
1	1/2"	1"
2	1/2"	1"
3	1/2"	1/2"
5	1/2"	3/4"
5	1/4"	3/4"
6	3/16"	1/2"
7	3/4" (30°	angle)

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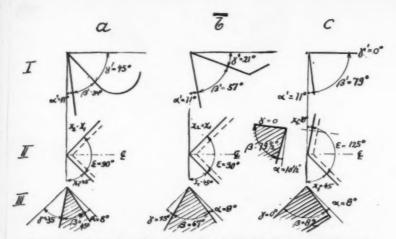


Fig 5—Comparison with cutting edges of High Speed Steel (a); Cemented Carbides (b) and Diamond (d) for the cutting of aluminum. Front adjusting angle Kappa=45° side clearance angle alpha=86°; front clearance angle about 11 deg. for all tools. I, side view; II, top view showing point angle; III, actual cutting edge. Observe that in the case of the third tool, all angles are atrengthened. Good cutting condition is obtained thru extreme polish of the surface.

quently overlooked). In (I) a side view of the tool is given. In (II) the top view is given and (III) shows a cross-section of the actual cutting edge i.e., a section perpendicular to the side face. Whereas, the High Speed Steel tool has a large front rake of 45 degrees, this tends to weaken the cutting edge in combination with the point angle of 45 degrees. The sintered carbide tool has the front rake reduced to 20 degrees, i.e., nearly half of the former, so that the tool cross-section is already more stable. In the case of the

diamond tool, the front rake angle is zero and further, the back adjusting angle only about 15 degrees, giving a point angle of (epsilon) E=125 degrees. The tool cross-section is weakened only by the side clearance angle of eight degrees. This diagram is only for demonstration purposes, and in practice, sometimes the back adjusting angle is reduced to zero and negative rake angles up to 20 degrees are used, thus producing still stronger edges.

Removable Centers are tool steel, hardened and ground. Equipped with screw tailstock. Made in sizes to swing diameters of 12", 18", 21", 24", with base 36" and 48" between centers.

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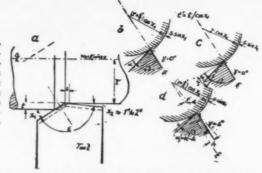


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Fig. 6a to d—Diamond cutting edge in working conditions. a—Top view; b section thru middle front edge; c—section near point of tool edge; d—adjustment above centre line by a value h, small in relation to the diameter of the workpiece.



In the use of shaped diamond tools, further special rules have to be observed. Besides, a very careful side adjustment an extremely accurate height adjustment must be carried out. The influence of cutting angles as well as feed (s) and depth of cut (t) on the actual cutting conditions is demonstrated in Figures 6a to d. The small back adjusting angle is

usually responsible for the fine surface obtained, since the back edge removes, more or less, any remaining crest of the feed ridges. In (b) a section is made thru the middle point of the actual front cutting edge, which is adjusted exactly on centre height. The thickness of the chip to be removed depends on the feed and the front adjusting angle. Near or directly at the point (c) the side clearance angle changes into the front clearance angle, which is considerably smaller than the former. Therefore, in order to avoid a weakening of the much stressed front edge, the side clearance has to be made as small as possible, and further, the front adjusting angle selected relatively small. Whereas in (b) and (c) it was assumed that the rake angle was zero as usually provided, on diamond tools an adjustment above centre height by an angle

delta with h=pi $(r \div \frac{t'}{2}) \cos K_1 \sin \theta$ delta









- . I" Collet capacity with I" hellow spindle clear through.
- . Uses any standard motor (not a special built-in motor).
- · Has 4-stop V-Belt drive.
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provides a positive rake angle of the same amount, whereas the actual clearance angle is reduced by the same amount.

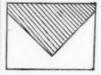




Fig. 7a and b-Diamond points and Shadowgraph used on the Taylor, Taylor & Hobson Profilmeter.

For the testing of surface quality, special instruments have been developed and in the present state of technique, feeling lever or tracer point instrument give the finest indication. (*8) These instruments are today, after unsuccessful trials with hardened steel needles, exclusively used with sapphire and diamond needles, with very small roundings. A strong diamond edge with the minimum possible radius is used in the Taylor, Taylor and Hobson Surfacemeter (Fig. 7a and b).

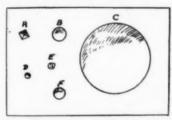


Fig. 8—Impressions by different Hardness Indentors:—A—Diamond Pyramid; B—Rockwell C (Diamond Cone); C—Brinell Indentation, hardened steel ball; D—Monotron (Diamond Ball); E—Shore Scleroscope (Diamond); F—Rockwell B. hardened steel ball.

(Reproduced from H. B. Pulsifier, Inspection of Metals, ASM, Cleveland, 1941).

In Hardness testing, the diamond points are more and more favored and Fig. 8 shows very clearly the reason for this. The impressions with diamond points are much smaller than those produced by steel balls, owing to the higher surface stresses to which these points can be sub-

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Results obtained in a number of plants definitely establish the use of factorycoated abrasive belts as a most efficient practice. Besides reducing the number of rejections and improving the finish, they have cut the polishing cost per piece through increased production.

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Whatever your problems may be, it is well

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Mattison Abrasive Belt Grinding and Polishing Machines are engineered with a knowledge of the factors involved to give the best application of belts. From the time factory-coated abrasive belts were introduced for metal grinding and polishing, Mattison's have developed

They are built for both the wet and dry grinding method. In addition to the finishing of metal parts, they are used for plastics, hardened rubber, fibre, glass, etc. In fact,

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jected. In recent years, further steps have been taken to develop more sensitive indentation tools in order to investigate structure and hardness differences in metal surfaces. Successful tools of this kind are of the elongated pyramidal diamond type according to Knoop (*9) and the pyramidal diamond mounted on a glass lens according to Hanemann-Bernhardt. (*10)

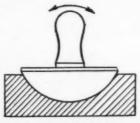


Fig. 9—Diamond mixing and grinding tool.

Diamond Dust.

Diamond Dust has slowly but steadily developed into a most important abrasive material. The crushing of diamonds does not represent a real technical problem, in spite of the fact that sometimes very hard diamonds are encountered which damage and even destroy mortars. The grading of fine diamond dust, however represents a very intricate technical problem. Down to a particle size of 300 mesh and even in special cases down to 400 mesh per linear inch, the grading by sieving is possible. But already the sieved powders deserve a special control after production by means of test sieves and microscopic control of both sieve and obtained powder. Since below 300 and 400 mesh, no sieves with metallic wires are obtainable, decanting methods have to be used. Settling methods (*11) in water or alcohol, centrifugal and airsifting practices are known, but experience shows that the grading in oil cannot be recommended. With these processes, diamond dust down to 1 micron size (0.001mm) can be produced with high reliability. Optical inspection methods are necessary,

Diamond dust has to be used either "loose" or "bound". For use in loose con-

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dition, the diamond grain has to be mixed with oil or grease. For the latter purpose, small ball shape mixing and grinding tools (Fig. 9) have proved useful.

In recent years, great progress in the production of grinding and polishing bodies has been made, involving sintered materials in which diamond dust is embedded. (*12)

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The Carborundum Co. Ltd. Trafford Park, Manchester 17.

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2 (1942) p. 61/64. (*12) P. Grodzinski, Diamond and Gemstone, Industrial Production, 1942, N.A.G. Press Ltd. London W.6.

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GOLIATH: Hello, small fry, where did you come from?

DAVID: Same place you did — Michigan Toel Company. And don't cell me small fry. Even if I am only a 's incher, I'm doing just as men size e job as you are.

GOLIATH: Piffle, infant. Why—you know what I de? I cut the teeth in battleship turbine reduction gears that run 8 ft. across or more.

DAVID: Just a 'hogger'!! Why, listen—I've get the jeb of cutting teeth on fine instrument gears and they've got to be held to less than two tenths of a thousandth.

GOLIATH: Hay, wait a minute. Just because I'm
— in the big time, doesn't mean that I'm
not there to the last decimal. I'm
streamlined, i am — ground all ever,
just like you.

DAVID: That's all right, big fellow, I wasn't trying to belittle you. After all we belong to the same family and we're both doing the best job we know how.

GOLIATH: Yep, they do say that about Michigan hobs, don't they?

. . . and if you want to help your hobs do a still better job, write for a copy of "Hobbing". Ask for Booklet No. 149 A.



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In the September issue, Mr. Almdale discussed the question of chip control and methods of determining chip breaker shapes and designs for steel cutting with carbides.

In the second section of this article, some further developments in connection with chip control are discussed.

SOMETIMES it is possible to eliminate the need for chip breakers by changing the rake angles to produce the desired chip control. The most common technique for doing this is to decrease the rake angles to obtain practically a flat top tool or to go still further and adopt negative angles.

Negative back rakes have been employed on many steel cutting operations for quite some time. Besides providing additional strength at the nose of the tool, they frequently serve to direct the chip in such a manner that chip breaking is satisfactorily achieved.

More recently, negative side rakes have also been employed, either in conjunction with negative back rakes or with zero back rake. They require discreet use, however, since excessive negative side rakes are likely to create such heavy loads on the tools that any gain in tool strength and chip control may be offset by the increased heat generation in cuting. A negative side rake usually facilitates chip breaking by squeezing or com-

pressing the chip until it breaks into suitable lengths.

Elimination of the ground-in chip breaker by use of negative rake angles has these advantages:

- 1-Less grinding time is required.
- 2-Grinding wheel costs are lowered.
- 3—The danger of cracking or checking the tip in grinding a chip breaker is eliminated.

The usual range of side rake angles is from 8° positive to 8° negative. To obtain chip control without a ground-in chip



Set-up for grinding angular type chip breaker in a standard single point tool.

^{*}Service Engineer Carboloy Co., Inc., Detroit.



IF HOBS COULD TALK ...



GOLIATH: Hello, small fry, where did you come from?

DAVID: Same place you did — Michigan Tool Company. And don't call me small fry. Even if I am only a 3½ incher, I'm doing just as man size a job as you are.

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In the September issue, Mr. Almdale discussed the question of chip control and methods of determining chip breaker shapes and designs for steel cutting with carbides.

In the second section of this article, some further developments in connection with chip control are discussed.

SOMETIMES it is possible to eliminate the need for chip breakers by changing the rake angles to produce the desired chip control. The most common technique for doing this is to decrease the rake angles to obtain practically a flat top tool or to go still further and adopt negative angles.

Negative back rakes have been employed on many steel cutting operations for quite some time. Besides providing additional strength at the nose of the tool, they frequently serve to direct the chip in such a manner that chip breaking is satisfactorily achieved.

More recently, negative side rakes have also been employed, either in conjunction with negative back rakes or with zero back rake. They require discreet use, however, since excessive negative side rakes are likely to create such heavy loads on the tools that any gain in tool strength and chip control may be offset by the increased heat generation in cutting. A negative side rake usually facilitates chip breaking by squeezing or com-

pressing the chip until it breaks into suitable lengths.

Elimination of the ground-in chip breaker by use of negative rake angles has these advantages:

- 1-Less grinding time is required.
- 2-Grinding wheel costs are lowered.
- 3—The danger of cracking or checking the tip in grinding a chip breaker is eliminated.

The usual range of side rake angles is from 8° positive to 8° negative. To obtain chip control without a ground-in chip



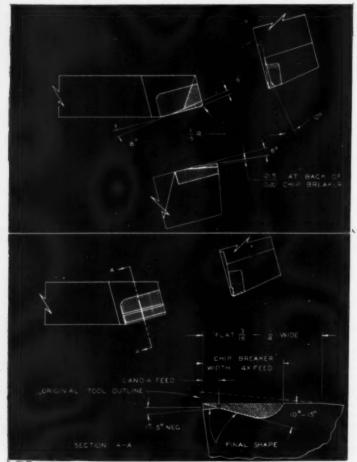
Set-up for grinding angular type chip breaker in a standard single point tool.

^{*}Service Engineer Carboloy Co., Inc., Detroit.

breaker, it is usually necessary to use a negative side rake of 3° to 8°. Most ordinary turning operations permit the use of aegative back rakes of 5° to 10°. In selecting the amount of negative side rake, the hardness of the metal can be used as a criterion. In general, the harder the steel, the greater the negative side rake that should be used.

On some very difficult interrupted cut jobs, a negative side rake of up to 15° may be used in order to assure maximum strength at the cutting edge. In this latter case, however, the depth of cut and feed should be kept reasonably small to eliminate excessive loading of the tool.

A typical job on which negative rakes were employed to obtain chip control





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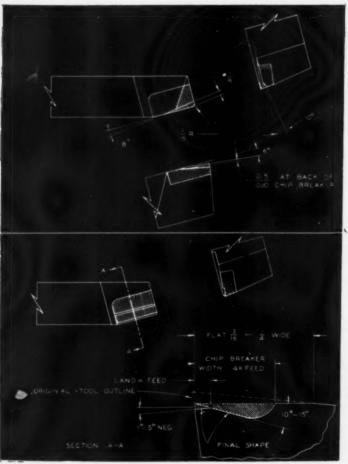
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Still another solution to the chip control problem is the use of a combination of negative rake angles and ground-in breakers. This practice is sometimes necessary when the chips are exceptionally springy and control is therefore dif-



Set-up for grinding parallel type breaker in 11/2" wide tool.

ficult. Here, sometimes, neither negative rakes nor conventional ground-in breakers are successful, when used alone. The ground-in types may not be able to cover a particularly wide range of cut depths or feeds on certain operations. Negative rake angles alone might have to be so extreme that the free cutting properties of the tools would be destroyed.

A typical job on which this combination of chip control methods was employed is the machining of a dome shaped forging of SAE 4340 having a Brinell hardness of 350 to 380. A Keller attachment was used for producing a facing cut on the



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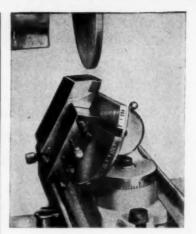
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With constant chip thickness and depth of cut, this operation would have been no problem. With the varying chip thickness, however, it was difficult to obtain a chip breaker which would work for both the 0.004" and 0.020" chip thicknesses. After much experimenting, the chip breaker shown in Fig. 7 was developed and the chip control problem was solved. With good chip control, a steady flow of coolant reached the tool and the production per grind was increased greatly.

It is interesting to note that this tool was made easily from a standard tool by grinding a portion of the top face at 6° negative back rake and 0° side rake approximately as shown. The chip breaker was then ground into the tool at 10° negative side rake and 6° negative back rake.

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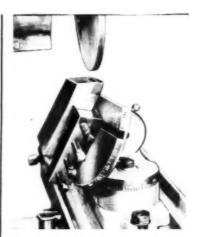
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advantages of both positive and negative side rakes is shown in Fig. 8. This tool, which works extremely well on stainless steel turning operations, is readily made from a standard tool in this way:—Grind a flat or zero rake surface approximately 3/16" or 4/4" wide on the top face of the tool as shown. Next grind a chip breaker in the tool at a side rake angle of 10° to 15° positive and approximately five times the feed in width. Then place the tool on a pedestal grinder with the table set from 1° to 5° negative angle and grind a land equal to the feed in width.

With this combination of negative side rake on the land and positive side rake in the chip breaker, the power consumption and the load on the tool are kept at a minimum, yet the cutting edge has much of the strength of a negative side rake tool.

Grinding the Breaker

While the grinding of chip breakers is fairly well understood, as the result of instructions carried in the manuals of various carbide tool manufacturers, several points do require emphasis, since apparently they are neglected frequently.

Chip breakers should be ground-in after the rough grinding and before the radius and cutting edge are finish ground. The reason for this is that the small vibrations set up in the grinding machine have a tendency to flake the cutting edge slightly during surface grinding. The slight raggedness of the edge after grinding the chip breaker is removed by the finish grinding and a slight hand honing to ready the tool for application to the job. As to grinding coolants, kerosene is generally considered to be the most economical and satisfactory fluid, altho cutting oils, olive oil, soluble oils, soda water and plain water are also used.

The steel shank should not be ground with a diamond wheel as this not only creates excessive wear of the wheel but even may damage it. The steel shank behind the carbide should be ground away before the breaker is ground in the carbide. Frequent reversal of the diamond wheel will produce more even wheel wear and will reduce the necessity of reshaping the wheel at regular intervals.

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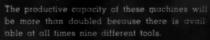


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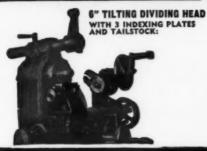
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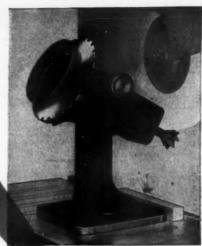
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WAR'S insatiable demands for mechanized equipment, ordnance and technical materiel has been a spur to development of revolutionary methods, short-circuiting time and expense, for their production. Metal cutting, as an operation in processing, is undergoing just such an upheaval. The last World War produced Widia, or Tungsten Carbide, as a cutting metal. But from this war is coming its full and adequate use, particularly for machining, specifically milling, of steel.

In the past, surface foot rates have seldom exceeded 80 feet per minute, particularly in multi-toothed cutters for steel. These rates have been stepped up to 800, in some instances as high as 3,000 feet per minute, in regular, run-of-the mine production operations. Feeds that seldom exceeded seven to 10 inches per minute in steel have been boosted to 25 and 30. In consequence, the time for cutting has been drastically reduced and production increased as much as 10 times.

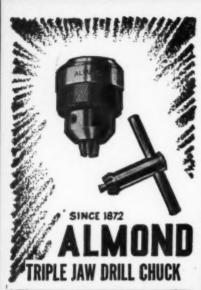
Sintered Tungsten Carbide, used as tip material since the late '20's in this country, is extremely hard but also, unfortunately, rather brittle. Its tensile strength is practically negligible. If the tips approach a workpiece with a positive angle, the least supported portion of the cutting tip is subjected to the relatively large cutting forces necessary to remove metal. But if the tips approach the workpiece with a negative angle, the point of contact between tip and job is against a well supported part of that tip. Hence the negative angle milling of steel, sometimes referred to as Hyper milling, is proving remarkably successful. Both the rake and helix angles are frequently negative. Sometimes the rake is zero combined with a negative helix, but always the cutting process is so designed as to bring the cutting forces to bear against the supported portion of the carbide tip.

This is the secret, in a manner of speaking, of negative angle machining. Frequent reference to this procedure will be made in these pages in the months to come. Its possibilities scarcely have been touched and the revolution that it has inaugurated is hardly begun. But the full benefits of the miraculous carbides as cutting metals are only now coming to be appreciated.

In the wake of this procedure comes the necessity, quite naturally, for supplanting manually operated fixtures with power or automatically operating holding devices. Otherwise loading and unloading time is out of all proportion to the cutting time, making it impossible as a consequence, to take full advantage of the saving in time effected by the reduction in cutting time. Ingenious developments and applications of magnetic chucks, or plates, pneumatically and hydraulically operated fixtures are following in the wake of this revolution in machining.

Increased power requirements of machine tools will render present equipment obsolete, in some measure and degree at least.

It is interesting to note in passing that Tungsten Carbide, a product of powder metallurgy process, is now in the company of a new industry revolving around this method. Powder metallurgy, while not as new as indicated by the birth of Carbides 25 years ago and other materials considerably farther back than



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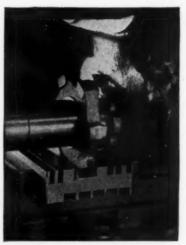
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that, is receiving a tremendous impetus from the current demands for better manufacturing methods that consume less time. Its importance and place, tho subject to exaggeration, should not be overlooked.

These and other fundamental trends are distinctly a product of this era of mechanized warfare. They will be referred to from time-to-time in these pages and illuminating examples of production procedures will be presented.

CARBIDE MILLING OF STEEL

An interesting example of the Carbide milling of steel, using negative rake and helix angles, is presented in Figure 1. This slotting cutter is removing metal at the rate of 15½" per minute, which is probably more than three times the rate that could possibly be used with a high speed cutter employing traditional methods of feed, speed and cutting angles.



The slot is ¾" wide by ½" deep and when the metal is removed from it at al 15½" rate, 11 hp is required. The material in this workpiece is SAE 4340 with a hardness of approximately 210 Brinell.

The cutter, shown in Fig. 2, is a Grayson design (Grayson Mfg. Co., Monrovia,



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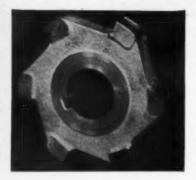


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Cal.) with a Meehanite body and Kennametal tips of KM grade or hardness. The combination of cutting angles is extremely interesting and very effective. It will be noted, in the first place, that this is a coarse tooth pitch cutter; six teeth for a 4" diameter cutter differs considerably from the usual cutter design and construction. The formula, if such it

can be called, and frequently employed in the West Coast aircraft industry where carbide milling of steel perhaps had its greatest development is D plus two, where D is the diameter of the cutter. Hence, in this instance, six teeth are embodied in this design.

There are two reasons, usually assigned for the use of coarse pitch in cutter design. In the first instance, power is not available for more teeth, as will be explained subsequently. Second, since the amount of metal removed is relatively large, accordingly large chip clearance (or space between teeth) is essential to successful operation and reasonable cutter life.

From the experience at hand at this early stage in Carbide milling of steel, a large chip load or chip thickness per tooth per revolution is absolutely essential. Chip loads of less than .05" cause deterioration of tips by abrasion. A chip thickness of .010" is preferred. Moreover, as will be explained later, high spindle speeds are necessary for successful carbide milling of steel. Hence, it follows,

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that if the traditional number of teeth are designed into such a cutter as this, the amount of power required would be exorbitant and out of all proportion to other factors in machine tool design. Coarse pitch tooth cutters therefore characterize carbide milling of steel. And this cutter is a good example of current practice in this regard.

Meehanite bodies are preferred, according to the claims of designers, because of the dampening effect of this material as compared with the more resilient and customary steel bodies. Thus, impacts on carbide tips are reduced and cutter life between grinds is prolonged.

In this connection, it is interesting to note, that the machine in this operation is equipped with a fly wheel on the rear of the spindle. The energy stored in this member assists with a "carry over" which softens shocks due to the coarse pitch, and dampens impacts on tips, spindle, gear trains and other vital parts of the machine tool mechanism.

But the most interesting feature of this cutter is the design of the teeth. The rake

angle is zero degrees. The helix angle is a double negative of seven degrees for that portion of the cutting tip on either side, while the center portion of the tip is brought to something of a point as is clearly evident from the illustrations. The cutter is, therefore, in effect, three cutters assembled into one body. The center portion is effective for the removal of metal from the middle of the slot, and the two side portions are used for removal of metal from the sides of the slot.

Perhaps the most significant feature of this successful cutter design is the removal, by grinding, of the center portion from every other tip. Thus, only three teeth are effective for removal of metal from the body of the slot, while the negative (helix) angle tips on either side, six in all, sweep the sides of the slot of metal. Chip interference is thus eliminated and long cutter life between grinds is assured. At any rate, these are the results in actual operation of this unique cutter used as a milling slotter.

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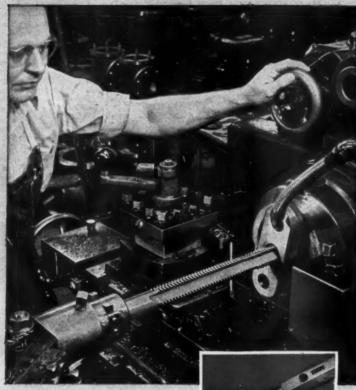
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manship regardless of the technique used, is all the more to be emphasized for the Carbide milling of steel. Thus, the distance between column face of the milling machine and cutter should be reduced to a minimum, as it has been in this set-up. Likewise, arbor supports must be set as close to the cutter (See Fig. 1) as possible to insure maximum rigidity. Table, knee and column gibs must be kept in proper adjustment. Also, all bearings, particularly the arbor support bearing. Without maximum rigidity incorporated into setup, cutter life will be reduced to the point where the gains, possible with negative angle milling, are lost,

The slotting of SAE 4340 material as indicated in this operation, is somewhat typical of carbide milling of steel as it is being successfully performed at present. Much remains to be learned concerning this unusual procedure that is contributing so much to the art of metal removal and assuming a definite place in American manufacturing. This introductory article, the material for which comes from actual shop practice, will be followed not only by interesting examples of negative angle milling but will be accompanied by attempts to lay the basis for the science underlying this most interesting development.

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An attractive colored poster, designed to awaken greater war-consciousness on the part of industrial employees, has been issued by Wagner Electric Co., 6400 Plymouth Ave., St. Louis, 14, Mo. It emphasizes the sacrifices which members of our armed services are making daily, in physical injuries and bodily disabilities. Copies of the poster will be sent free of charge—and they should be helpful in stimulating sale of War Savings Bonds.

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ARBOR PRESSES

In arbor press design, it makes con-siderable difference, whether the press is used only for odd work, repairs, experi-mental work, etc., or whether its chief work will be on production runs.

Relatively slow action is not serious in the first case, but it is decidedly so in the last. Also, for presses to be used on production runs, it is important to relieve the operator of everything that can be done without his particular attention. Thinking along this line, there is one builder of both electric and hydraulic models in 40 and 60-ton units incorporat-

ing automatic pressure control on his electric presses, relieving the operator from watching this end of things. These electric presses offer choice of ram speeds and travel. For the hydraulic presses, slow and fast pump speeds are available.

Regardless of whether odd work or production runs are being handled, there is a certain advantage to be gained by leaving hands of the operator en-tirely free. Realizing this, one relatively light hydraulic arbor press, having a 10-ton capacity. has been arranged so that it is completely foot-controlled. having no levers or wheels for hand operation.
This is a very
speedy little press.

In general, the arbor press has been chiefly used for bending, assembling, straight-

ening, and similar jobs, but in many places it is going much farther. One firm building pneumatic arbor presses, in addition to the above-mentioned duties, furnishes them for broaching, molding, keyway cutting, oil grooving and similar duties. These are especially high-class presses, the actuating cylinders not only being perfectly bored, but properly honed, so there is no leakage or waste of airpower. A simple outside adjustment is provided for the piston packing, allowing easy maintenance of an efficient piston seal. Such presses are available in a wide range of capacities.

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Probably no one thing so slows up the inventory as counting small parts.

One way much used for arriving quickly at nu mbers of small parts on hand is to use counting - scales. The basic idea is to set up a unit of count per weight. Then, by weighing the parts on hand, the approximate number may be quickly found.

There are a number of scale manufacturers who supply units particularly adapted for counting service. Some of these scales incorporate photoelectric cells, automatic printing devices, and other electrically controlled mechanisms.

Production counting is a different
proposition, and
where a machine is
involved, it is often
possible to use
counting devices of
wheel gear type,
which register at a
given motion of the
machine.

An outstanding case in point is at the power press, where each stroke of the ram produces one or a given number of pieces. By arranging for the ram to actuate the counter, an automatic count is obtained as the pieces are produced. Care should be taken not only to install such a counter so that the motion of the ram will positively actuate it, but also to place it and hook it up so that the counting device cannot be otherwise actuated. This eliminates changing the count by hand. This has been known to happen in a number of cases. Some of the count-



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One of the things which have gone far to raise industrial counting to a more efficient plane, is the photoelectric cell. Since the interruption of a light beam can be made, through one of these devices, to actuate a mechanism, it can be made to operate a counting mechanism.

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The staff When a And wit Counted Express But the As he Here Look Eve M

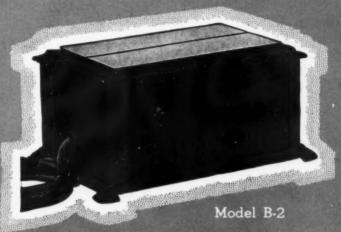
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Broaching—a better way to do many metal working jobs—is the only right way to do some! Cutaway view of Eaton aircraft fuel pump (left) shows distinctive rotor principle, depending for efficiency on accurate fitting.



Teeth in outer rotor are broached on a standard American hydraulic broaching machine. American broaching tools, designed specifically for the task, provide high output at economical cost. American's complete broaching service—machines, tools, and engineering — makes war production more efficient, post-war production more profitable.

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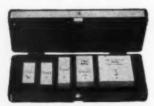
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THE FOREMANSHIP FORUM By Edmund Mottershead

PART XIV.—PRODUCTION PLANNING

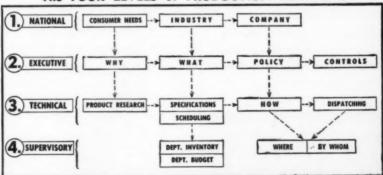
THE watchword today is planning—post-war planning, planning for security, planning for financing, for production, for invasion. Why? because the war has put a discipline of stern reality and harsh necessity upon us. The creation of wealth is no longer measured in our thinking in dollars and in profits, but in terms of goods actually produced—even in terms of goods produced and brought to the actual point of use, whether by the consumer on the home front or by the armed forces in contact with the enemy.

The whole problem has resolved itself into one of production planning. The requirements of all-out war effort have forced us to plan, whether we like it or not. From the governmental plans of the War Production Board and other agencies

down to the housewife tediously counting out her ration points, we plan as best we can.

In the whole problem of production planning for the war effort, there are four essential levels of planning activity. as shown on the accompanying chart:planning at the national level, by those charged with the workings of the national economy-planning by top management of the individual enterprise-planning at the technical level, devising ways and means of giving physical form to the plans of the executive-and planning at the supervisory level in industry, among those charged with carrying out the plans of the higher groups and seeing to it that the goods flow thru the various processes of production and actually get out and into use on time.

The FOUR LEVELS of PRODUCTION PLANNING





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These articles represent an attempt to clarify some of the functions of those engaged in planning at each level, marking off some of the typical limits of responsibility in each. It is not an attempt to handle the problem of whether or not to have a "planning department" in an industrial concern. Whether such a department exists or not, the planning must be done by someone. Nor is the discussion confined to any one type of industry, because whether the concern is typically job shop or high production in its operations-whether it is engaged in making one product or several, in war product manufacturing or in the production of so-called civilian goods, planning is essential.

In each section, covering each level of planning indicated, three basic questions will be answered:—(1) What is the planning function of this level; (2) Who does it and; (3) What are the factors that must be considered in planning at this particular level?

Production Planning at the National Level.

Dr. William F. Ogburn, Professor of Sociology at the University of Chicago recently stated that freedom of enterprise must be sacrificed to the war state. Personally, I think we might say that our system of free enterprise already has been sacrificed to the war state, and that the process is perhaps not entirely complete, but certainly will become more nearly complete before long.

The fact of the matter is complexities of modern economic life are such that there is probably no such thing as a "free" economy any more anyway. True, if we can keep within bounds, the small minority who would have the country plunge whole heartedly for the planned economy of the socialistic state now and after the war forever more, we can very likely retain to a large extent the system of private enterprise with which we are familiar.

But private enterprise must justify itself as a system in our post war economy. It must fit within a pattern of planning for the common good at the national level. The exigencies of the present war have already imposed certain changes, certain rigidities upon our economic structure.



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To date, the federal government has invested or is committed to invest about \$14,000,000,000 in new industrial plants. "This represents about a fifth of the total private investment in American factories and mines in the year 1939, and is almost four times the investment of private interests in expanded war plants"-according to the United States News. The Defense Plant Corporation handles these operations on a government business partnership basis, but the fact that the government is such a large holder of capital goods investment will have a profound effect upon post war economy and post war industrial operations.

While various agencies of the government are actively engaged in post war planning of one kind or another, industry is not idle. Roger William Riis, writing in the May issue of Advertising and Selling describes the activities of the Committee for Economic Development. This committee, with a board of trustees consisting of 18 leading industrialists and economists of open minds, neither anti nor pro New Deal, guides two committees, one of research, and one of field development. The research group of economists is digging into the economic problems of post war life. The field development committee is spreading the work thruout the country into every community. "They started their thinking with the job, the worker, and the machine." New ideas for production-new products to fill consumer needs, new methods, new materials - are waiting and ready to serve the consumer and maintain employment after the war, "Out of this examination of the economic scene will come, for the first time, true knowledge of just what it is that makes a 'job', how best we can insure the jobs we have and make more of them, and how we can widen the horizon for every job."

Here is the committee's philosophy, according to Mr. Riis.—"Our program originates and is limited by certain articles of faith. We believe that the common good is prior to and higher than the good of any individual and of every private interest. We believe in the American system of free enterprise. By that we do not mean that the government should let business alone, nor that economic op-



bumps and jounces that might knock them out of adjustment.

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portunity should take precedence over political liberty, nor that the 'good old days' of the '20's should return. By free enterprise, we mean freedom of opportunity, opportunity to work, to live decently, to educate children in the arts of citizenship and human happiness and in the skills of a trade or profession to provide against sickness or old age. We stress opportunity, not contrasted with security, but identified with security. We believe in socially responsible risk-taking for the common good, with the hope of private profit as an incentive." The system of free enterprise must justify itself after the war.

This is not a pressure group, nor a political agency, nor a trade association, nor is it something which will be superimposed from the top upon our society. It is grass roots stuff, drawn from and of the people. It is the kind of thing of which there should be more. The need for national planning has been demonstrated to us sufficiently. What form that planning shall take, who shall do it, and what shall be considered in that planning rests with us. We can let it go in the press of immediate necessities, allowing small minds and seekers after personal gain and position to talk of planning and bungle with planning on their way to power-or we can do it ourselves.

Planning involves not so much the establishment of a pattern and then breaking down all opposition to enforce that pattern as it is the determination of an objective—the finding of certain means to attain that objective, and the finding and preparation of alternate means to obtain the objective IF thus-and-so happens. Effective planning means being pre-

pared for any emergency.

At the national level, this planning for production, or in a broader sense for security or prosperity, starts with the consumer. What are the consumer's needs? What goods and services will he require? It may or may not be necessary to have one central fact finding agency to compile such data. It may or may not be necessary to have such an agency as a part of governmental activity. Certainly private enterprise, thru some agency as the Committee for Economic Development, could find the information and make it available to industry. In any



hey're setting 'em up for Smiling Billy, tonight!

SURE and there are those who'd punch the nose of the man who wouldn't lift one to Billy, tonight — in a dignified fight, of course.

For we've turned back the timeclock to March 7, 1903, when Smiling Billy had a hand in the destiny of a great American industry. . . . He fought a hattle with a giant turbine, while history hung in the balance.

He was a shop foreman in one of the early plants of General Electric. His company had pioneered research in turbine engineering, and had staked its reputation on the plans of the first commercial steam turbine generator. It was to be a gigantic machine, and the Commonwealth Edison Company of Chicago had courageously designed their entire new Fiske Street generating station around the plans for this unbown behemoth. . . The date they had set for the official test was March 7, 1903.

By February, the turbine was still months from completion. A meeting of foremen was called. "Who among our general foremen is 100 per cent qualified to complete the building of the turbine on time?" they were asked. A single name had the vote of every man there.

The story of Billy's battle with the turbine is a minor classic of one man's knowledge of machinery, tools and men. Around him lay thousands of unfinished parts. Ahead of him lay the task of assembling a machine as big as a two-story house and as delicate as a lady's watch — that could shatter itself to pieces from a microscopic error in tolerance.

He won. On March 7, less than three weeks from taking over, Smiling Billy waved a grimy hand, and the first big turbine generator began to whine a brand new song of power. History is made that way. It's being made that way today,

in the biggest battle of all time, because many of the great men of industry are men with grease on their hands.

Today, Jones & Lamson machine tool engineers are working with those men on hundreds of America's most important assembly line jobs — and have been from the very beginning of every great industry in America. They were there in the days of Smiling Billy, and they 'Ill be there tomorrow when you call!



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case, however, such information is essential to integrated production planning at the national level.

Why do I say start with the consumer's needs? Because the goal of all our striving is a better life—a more abundant life—with greater opportunity, greater income, and greater security for all. The only way in which to increase the wealth of the country—the only way in which to increase the real income of the people, is to increase production of useful goods. The goal cannot be \$\$\\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$ profit, because profit is measured in money, and a mere increase in money simply means higher prices, not more goods and enjoyment for consumers.

Logically then, the effective goal of all effort must be production, either of goods or services. Profit is a natural and satisfactory by-product. Workers, management, and owners are essentially partners. Workers who own stock are at once workers, owners, and consumers. The consumer who owns a little stock is consumer, owner, and worker, etc. The goal of an industrial organization must be to serve a need by making an increasingly better product at a continually lower price. This is a state of mind and a philosophy. Actually, it has been demonstrated in several companies that higher wages for workers and larger "profits" for owners result from increased productivity.

Production planning at the national level, then, must start with consumer needs, apply the principles of intelligent selfishness to set up increased productivity as the goal of industrial enterprise and then, investigate the capacity of industry to produce, considering the job, the worker, and the machine, as the Committee for Economic Development is doing.

The responsibility for productive planning at the national level rests squarely upon the shoulders of top management as a collective group, working in cooperation with the representatives of interested groups and governmental agencies for the common good.

At the final stage of national planning, the individual firms have the problem of determining their relative efficiencies as producers of various types of goods. Thus, they must determine which goods shall be



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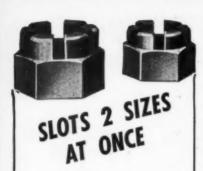
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produced to fit the best into the industrywide or total national production pattern. This principle of relative efficiency is especially important in the thinking of industrial planners today because such a large part of our industry has been converted from peace-time production to the production of war goods. It is problematical whether products these firms turned out in peace time again will be the goods they will produce after the war. The point is that each plant should make a definite effort to determine its relative efficiency as a producing unit with reference to processes and job skills per worker and in relation to capital investment and overhead. Then this picture should be contrasted with various products which the plant and others can manufacture. It is possible that many will be engaged in post war production substantially different from their prewar activity.

Production planning at the national level then, must take a leaf from the notebook of our war economy. War production in the totalitarian state determines the strategic and tactical objectives first; the supplies, men, and material required second: the production facilities third. War production in this country has followed that pattern more or less. modified by our own traditions and by the various boards and committees which have had a hand in the planning procedure. Thru some fact finding medium. national consumer needs should be the first consideration in post war economic production planning.

Industry-wide planning as being done by the Committee for Economic Development comes next, and finally the planning of the individual companies based upon their relative efficiency as producers of certain types of goods.

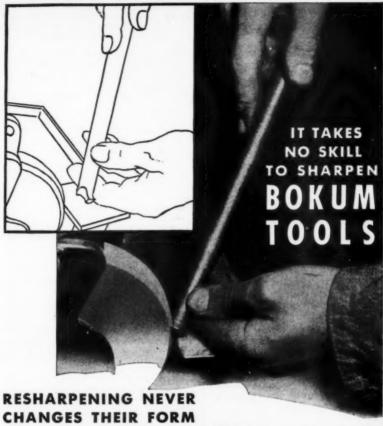
Summary: -PRODUCTION PLANNING AT THE NATIONAL LEVEL

(1) Determine CONSUMER NEEDS.

(2) Industry-wide planning.
(3) Relative efficiency of individual plants to select particular products.

Production Planning at the Executive Level.

We have previously defined production planning as the business of being prepared for any conceivable emergency which might arise-not so much the rigid



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enforcement of a predetermined pattern of action, as having ready the answers to variations in the program as they arise.

Of the four levels of production planning:—national, executive, technical, and supervisory, this section is devoted to the executive level of planning—the planning function of top management. There are four factors to be considered—why have production planning at this level, or the objectives of executive planning; what specific products shall be produced; the determination of general plant and production policies; and the establishment and maintenance of production controls?

The objectives of executive planning hings upon the philosophy of intelligent selfishness in industry and production for use, not for profit. When consumer needs, and the production of an increasingly better and more useful product at an ever lower price, are set as the objective of the enterprise, then the problem becomes one of selecting which consumer needs in the firm's particular field of production that individual company shall endeavor to satisfy.

The determination of specific items to be produced starts with a study of what the firm can do. What are the present facilities? What are all of the various job skills of the existing personnel? What machines and equipment have they, and what capacities and to what purposes can these machines be devoted? What additional labor is conveniently at hand in the local labor market—the city or town—without going outside that labor market for additional workers? What are available power, transportation and storage facilities?

Having obtained a complete picture of ALL possibilities for the firm, apply the same analysis as far as possible to the firms likely to be in competition, either in the same markets or producing the same products—or different products designed to serve the same needs.

When all the facts available are at hand concerning both the individual firm and its possible or probable competition, the next step should be to determine the relative efficiency of manufacture of the desired product or products. This factor of relative efficiency applies equally to the enterprise of individual firms as it



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ORD, 0) does in determining the specifics of international trade. It might be said that relative efficiency among competitors is hard to determine. Perhaps so. In most industries and for most products it has never been attempted. However, the U.S. Navy Department, Bureau of Ships, during the months of August, September, and October, 1942, conducted a survey of the electrode industry as a factual basis for price adjustment of government contracts. The ratings of the welding rod manufacturers were determined on the basis of welding rod output per dollar of equipment invested. The comparative ratings of some 14 different companies ranged from 6 to 37 points. This may or may not be the basis for similar rating of relative efficiency, but it is at least an indication that the thing can be done.

The determination of general policies for the production organization thus starts with a sound basis of allowable maximum costs from a consumption and a competitive standpoint. Further general policies covering materials, methods, labor to be used, training programs, wage payment and incentive plans, as well as specifications and standards for the products follow.

The fourth and final function of planning at the executive level is the establishment of controls and the maintenance of such controls over the production process. This involves two things: -the establishment of a plant system. records, reports, charts, and the like; and the maintenance of a liaison crew of expediters (whatever the exact title, their function is the same) to see that the system is maintained and that production flows as required.

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ILLUSTRATED BULLETIN ON REQUEST

1. CONN. RIDGEPORT

Summary:-PRODUCTION PLANNING AT THE EXECUTIVE LEVEL.

(1) Set objectives; production for use. (2) Determine specific products to be manufactured:—(a) Find possibilities. (b) Find relative efficiency

(3) Outline general plant policies within limiting costs; as to materials, specifications, design, wage payments and incentives, standards, etc.
(4) Set up and maintain control system.

Production Planning at the Technical Level.

Planning is the process of being prepared in detail for action in any conceivable emergency, in any imaginable circumstances affecting production. Of the four levels of production planning, national, executive, technical, and supervisory, this section is devoted to the technical level. There are four factors or divisions to this level of production planning:-product research, specifications and scheduling, methods, and dispatching.

Reference to the diagram indicates the relation of these functions to the functions of executive planning.

Product research as a term, covers a multitude of activities, and is really broader than the function of experimenting and developing new products. It covers the investigation and answering of consumer needs. It means the development at times of new products for such needs, and of further new products to satisfy needs created by technological changes in the company's products and elsewhere. It means investigating the possibility of applying present skills and mechanical manufacturing facilities to other products which might be produced more efficiently. It means the application of present products to new consumer uses so that sales and production may be increased. In a previous section I spoke of fact-finding activities of top management to determine the products that should be made, to determine consumer needs which should be served, and to find the relative efficiency of manufacturing various types of goods. The actual work of collecting and analyzing this data falls to the technical group in the function of product research. It is both the basis for determining the objectives of production, the answering of "why?" at the executive level, and also the scientific



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This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¹/4" band. The ideal portable unit.

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WALLS SALES CORP. 96 Warren St., New York, N. Y. carrying out of the objectives so determined. From the function or department of product research at the technical level and from the policy determining of the executive in selecting specific products, we arrive at the technical function of determining specifications and scheduling.

In the determination of product specifications and production schedules, planning at the technical level answers the questions of how many and when, material, design, standards of acceptable production, and, within the limits already established, costs and prices. Naturally, the sales department is the prime mover in determining how many, but howmany-when is inexorably linked together.

From this function and from the executive determination of broad general policies, evolves the technical function of determining how the goods shall be produced. This includes not only actual methods of production in terms of operations, layout of plant and flow of work, but also job methods, time study, and rate setting, as well as the consideration of such problems as bonuses and incentives.

Dispatching, determining the order of processes and jobs to be done, and the assignment of specific tasks to specific departments is next. This is both the carrying out of the determined "how" and the detailed follow thru of the controls established at the executive level.

It must be remembered, that here as at other levels discussed and diagrammed, no reference is made to a planning department as such; that the attention is focussed on functions rather than persons, and that in many instances the same person in a plant may be carrying





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NEW BRITAIN TOOL & MFG. CO. NEW BRITAIN, CONN., U. S. A. out planning functions at two or three levels and in several departments.

Summary:—PRODUCTION PLANNING AT THE TECHNICAL LEVEL,

(1) Product research,

(2) Specifications and scheduling.

(3) Methods.(4) Dispatching.

Production Planning at the Supervisory Level.

The supervisory level of production planning is the level at which planning comes to grips with materials and men and machines to produce the goods. The supervisory level has essentially two types of activity in planning work:—department inventory and budget, and the determination of which machines and workers shall be used for specific operations.

By department inventory I mean that the foreman, supervisor or group leader should have either in his head or in writing (preferably in writing) a complete inventory of machines and equipment, the operations and capacities of each, the overhead and costs involved in each, etc. Also a similar inventory of the manpower in his charge, including the skills and abilities of each of the workers, their productivity and suitability for various types of work etc. Also a perpetual inventory of the parts and tools and materials with which he has to work.

The departmental budget springs from that inventory of man and machine power. The production schedule of the department is probably set at a certain level. A certain amount of labor, in terms of man-hours is available to meet that quota. The department is put on a budget, whether supervision admits it or knows it or not, just as much as any governmental department is put on a budget by Congressional appropriation. The important thing for the foreman to realize is that he IS on a budget and that he will have a better grasp of his departmental affairs if he keeps the necessary records and handles the budget instead of being just dimly aware of things.

From the inventory and budget at the supervisory level and from the methods and controls determined at the technical level, we arrive at the ultimate determination of where and by whom the goods shall be produced—which machines and

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The Grand Rapids No. 1/2 Universal Grinder has been designed and built to meet the demand for a high grade machine of medium capacity selling at a moderate price. This machine can be operated from the front or rear. Transverse, vertical and longitudinal movement can be made from either position.

Both vertical and cross movements are provided by means of an "Acme" thread in a bronze out of liberal size. Both are fifted with graduated dials reading in thousandths of an inch. Sturdy, rigid of design it insures a freedom from vibration and guarantees the ability to produce accurately ground tools.

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E. A. BAUMBACH MFG. CO. 1810 So. Kilbourne Ave., CHICAGO, ILL what individual workers will be used.

Production planning at the supervisory level, then, is the operation of a departmental budget of men, machines and materials, on the one hand, and the specific determination of which machines and which men shall be set to specific tasks. To a limited extent, it also means determining which workers shall be upgraded and trained and how they shall be trained. It means corresponding cooperation with the personnel department. And it means supervision should have this information in an orderly form, which permits its use by others who may take over the department, and by the technical and executive planners who need the information for the formulation of policies and for making basic de-

Planning, whether at the national, executive, or technical levels, whether done by a planning department or by one man. whether in a given firm there is an overlapping of functions among men or departments, means being prepared for emergencies. As Abe Lincoln is credited with saying:-"If we know where we are and where we have come from, maybe we can figure out where we are going." But planning today must answer more than the question "How?". It must also answer "Why?". It must start with needs, with consumer requirements rather than with the desire to make a profit. It must be based upon intelligent selfishness. Summary: -- PRODUCTION PLANNING AT

THE SUPERVISORY LEVEL. (1) Departmental inventory of men, time,

machines. (2) Departmental budget.

Which machines for what operations. (3) Which men on which jobs. (4)

PRECISION MADE VIATION TYPE ERSAL JOINTS

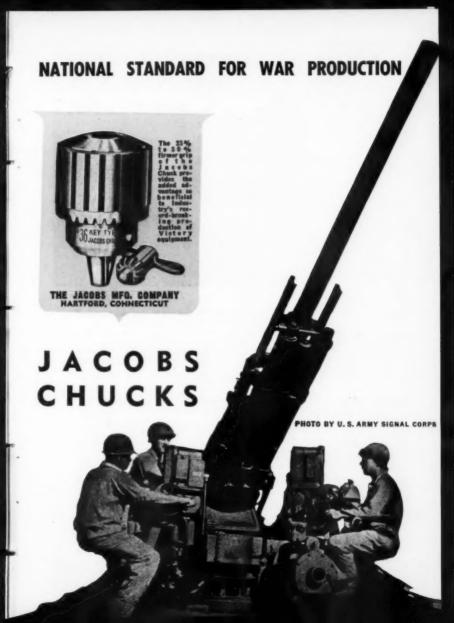
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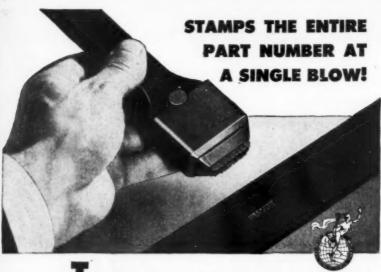
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- Grinds both circular and flat form tools, templates, profile gages, cams, dies, etc. to accuracy of .0003".
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- Not limited by regularity nor irregularity of work, nor by straight lines, angles or curves.
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BULLETIN M-120-143



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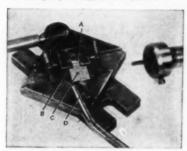




stown Talk Shop

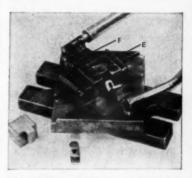
SUBSTITUTING PUNCH PRESS FOR MILL AND DRILL OPERATIONS

By suggesting and developing a punch and die to pierce elongated holes in cast-copper branch terminal connectors, Joseph Mizak, a toolmaker at General Electric's Bridgeport Works, helped speed production of important combat equipment and earned an award of \$1200 thru the Company's suggestion system.

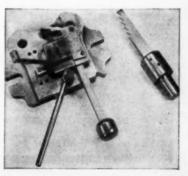


Fixture for punching elongated hole in connector (A) set in die (B) and locked by pusher block (C) and cam (D).

The job was done previously by drilling a 3/16" hole in the connector and then elongating the hole to 5/16" with an end miller. That method left burrs almost an inch long in some cases, which had to be removed by filing. Mizak's chief purpose in developing his punch and die method was to minimize the burrs, which it did. But his method also proved to be a faster and simpler means of doing the job. Use of the piercing method for the job is particularly interesting because the diameter of the hole is smaller than the thickness of the material—½"—and was facilitated because the material was soft cast copper.

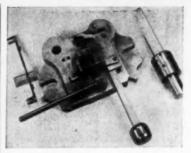


After being punched, connector is knocked out of fixture by ejector (E) actuated by cam (F).



Busbar locked in die, Broaching punch at right,





Bar removed (left) after 5/16" slot has been punched.

The work is set in a die and locked by a pusher block and a cam-lock arrangement. The operator pierces the hole in one stroke, indexes the cam lock to release the pusher block, and removes the work by indexing another cam lever which actuates a U-shaped, spring-return ejector.

The success of this method led Mizak to develop a second fixture for another job of the same type. This is a broaching punch and die for slotting a cast-copper busbar, previously a milling operation which left burrs that had to be removed by hand filing. In principle and operation, this fixture is similar to the first one. The work is set and locked in the same manner, and removed by a spring-return ejector. The slot, 5/16" wide, is punched through an 11/16" diameter. A five-toothed broach is used because of the short stroke of the presses available for the job. On larger stroke presses the broach could be designed with more teeth for a lighter cut. The five-toothed broach does not leave burrs, however.

SPEEDING FABRICATION

Suggesting the substitution of a driving arm for the conventional driver and dog in the cylindrical grinding of small rotor assemblies, H. E. Boynton, a grinder operator at a General Electric plant, helped speed production on an aircraft part.

As is common in short-cycle plunge grinding operations, it was difficult for the operator to perform the necessary gaging during the grinding cycle, because much of the grinding cycle time was spent in assembling the dog to the next rotor to be machined.

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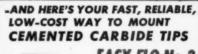
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There's seldom any need to scrap even badly shattered tools today, for you can restore them to good-as-new working condition in quick time and at a small fraction of their replacement cost — with EASY-FLO. It's EASY-FLO's low working temperature, exceptional free-flowing quality and high-strength of joints that make possible this fast, inexpensive tool repair.

Industry's grapevine is passing along this good news and already hundreds of manufacturers are saving days of delay and hundreds of dollars by repairing cutters, broaches, punches, dies, taps, drills and many other valuable tools, the easy EASY-FLO way.

BULLETIN 12-A gives full details. Write for your copy now.

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makes a clean union between tips and tool shanks that has one-piece strength. Its low temperature makes overheating easy to avoid. Leading curbide tool tip manufacturers recommend it. Full instructions in Bulletin No. 11 Copy on request.

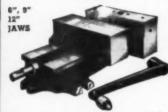


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GRAHAM MULTI-PURPOSE



Above plain vise quickly converted into jig or fixture as shown below



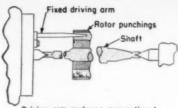
Vise with some of available attachments

In the 12" size, weighing 122 lbs., this vise has the bed-rock holding power for heavy planer or shaper cuts. In its other sizes it serves ideally for drill press, miller, grinder, radial. Note the flush construction, with parallel and right-angle surfaces, making for ready positioning. All vises are drilled to receive special interchangeable jaws, stops, guides, etc., thereby converting to a vast variety of special jig and fixture requirements. Busy shops save endless toolmaking hours which would otherwise be needed for making the jigs and fixtures these vises provide ready-made.

Request Illustrated Price Circulars

GRAHAM MFG. CO.

54 Bridge St. East Greenwich, R. L.



Driving arm replaces conventional dog and driver in grinding small rotor

Elimination of the assembly operation was made possible by the fixed driving arm arrangement suggested by Boynton, giving the operator adequate time for gaging each piece as it is finished. As a result, no "overtime" grinding cycles or carelessly gaged assemblies occur to slow down fabrication of the rotors.

ANGULAR SET-UPS

Here is a quick method of obtaining accurate angular set-ups for jig boring, devised by the use of the Robbins Sine Plate manufactured by Robbins Engineering Co., 318 Midland Ave., Detroit, Mich.



The Sine Plate, ordinarily used only for angular inspection work, is adjusted to

straight line drive is not practical

. S. WHITE For Power Drives For Remote Control

> need for our shafts in war equipment confines

production and service to war work until Victory is won.

OUT

Flexible Shafts are the simple answer in a large percentage of cases where power or remote control must be carried around corners, past obstacles and through congested areas as in aircraft.

Flexible Shafts are also aids to better designs because their use makes it possible to place driving and driven or controlled members wherever they should be to satisfy the requirements of space, ease of assembly, elimination of alignment problems, convenience of operation and servicing.

ASK FOR OUR BULLETINS

BULLETIN 1238—Power Drive Flexible Shafts. BULLETIN 38-42-Remote Control Flexible Shafts

Copies mailed on request.

Dept.H. 10 East 40th Freet, New York 16, N. Y.

the required angle-either single or compound—by the use of standard gage blocks. The work then can be attached quickly to the plate, with no possibility of slipping or changing positions during the boring operation. The Sine Plate, being non-magnetic, is not dependent on electric current being available where it

STEPPING UP PRODUCTION Machining two tail guides instead of one with a single machine setting, thereby doubling the rate of output for this vital engine building operation, was an outstanding suggestion adopted recently



COOLS HOT BEARINGS

Prevents cool bearings from running hot. A proven aid on "tough" lubricat-

ing problems. Simply mix with your heavy oils or grease. Increases lubricating properties. Saves wear on all bearings. gears and moving parts of machinery.

Added to cutting oils, it saves tools and produces cleaner, smoother surfaces. Gives cleaner draws, reduces upkeep on dies for deep drawing and on all punch press operations.

SEND FOR FREE SAMPLE

Department M. T.

SCIENTIFIC LUBRICANTS CO.

Established 1914

3469 No. Clark St., Chicago, Illinois at the Mt. Vernon, Ohio plant of The

Cooper-Bessemer Corp.
This suggestion involved equipping the horizontal boring machine so that two tail guide sections could be aligned on bed of the machine and identical boring. facing and milling operations could be conducted simultaneously in one opera-

Tail guides ranging in weight from 2000 to 2500 pounds, with diameters from 4'21/2" to 5'31/2", are now being produced at a rate virtually twice as fast as before due to this dual machining arrangement. The guides comprise the end pieces of main frames of large horizontal gas engine driven compressors used for main line gas transmission in key pumping stations, and for certain phases of production in the oil, gas and synthesis industries.

The idea was suggested by machinist Harvey Darling (who appears in the illustration) a veteran with 44 years of service at the plant.

FOOT TRIP ON ARBOR PRESS

By incorporating an air cylinder on a hand arbor press so that it can be operat-



THREAD MILLING CUTTERS, COMBINATION CUTTERS AND CIRCULAR THREAD CHASERS

Class 1, 2 or 3 fit, in any thread system and thread angle. Shell cutters up to 7" O.D. and 5" width, Taper shank cutters to 12" overall length.

ALSO RADIAL RELIEVED END MILLS. FIRST SHIPMENT WITHIN 2 DAYS ON ORDER OF MORE THAN 25 ITEMS.

U. S. MACHINE TOOL MFG. CORPORATION CLINTON, IND. PHONE 85



SUNOCO EMULSIFYING CUTTING OIL

... boosts cutting tool life 40%...speeds production...improves finish

Here's one plant where vital parts for war machines are being produced in almost half the time it used to take . . . thanks to Sunoco Emulsifying Cutting Oil.

According to reports slow speeds were necessary because of excessive heating and smoking. Tools were rapidly. Cutting oil costs were high. Then a Sun Doctor of Industry was called in. At his suggestion a switch was made to Sunoco. In one week, results were remarkable. With Sunoco's high heat-absorbing and lubricating qualities, speeds were increased. Seven parts were produced each hour instead of the former five . . . making possible 16 "extras" per day

with no increase in tool grinding. Finishes were noticeably finer. And all at a saving of 10% in cutting oil cost.

This is only one of many cases where Sunoco Emulsifying Cutting Oil is speeding the production pace of American industry in its race with War. Probably a similar speed-up can be accomplished in your plant. Call in a Sun Oil Company Engineer—write or phone your local Sun office.

SUN OIL COMPANY, Philadelphia
Sun Oil Company, Limited . . . Taranta, Comoda



SUN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMER



The HAMILTON
MUEHLMATT
Super Sensitive
DRILLING MACHINE

... SAVE ON SMALL DRILLS

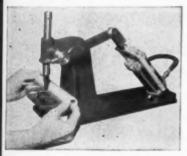
Speed . . . Sensitivity . . . Easy Performance

Get all three and plenty of other advantages in this precision-built machine. For production or maintenance... for tiny holes from .004" to .250" diameter.

THE HAMILTON TOOL CO.

HAMILTON OHIO

ed by a foot trip, A. S. Kocis, a methods man at General Electric's Schenectady Works, reduced the fatigue element in using the machine for I ight riveting, swaging and forming. Consistently better work is the result.



In Mr. Kocis' set-up, an air cylinder is connected to a 90-lb air line. A lever arrangement permits up to ¾ ton pressure at the work point. The vertical travel of the ram is up to ½". After tripping, the ram will stay down as long as the foot trip is depressed. Upon release of foot

trip, ram is returned to the "up" position by springs on sides of cylinder.

USING TODAY'S SOLDERS

Today's solder decidedly differs from pre-war solder, and so should soldering technique. Previously solder was composed of tin and lead in about 50-50 ratio. Today, except for certain applications, solder contains not more than 20 per cent tin, with perhaps small amounts of silver, bismuth, antimony or tin. Today's soldering technique calls for a hotter soldering iron, and attention to certain details. How to make better soldered joints has been explained in a communication issued by the metallurgy committee of the General Electric Co., which says:

(1) Keep your work clean. Guard carefully against varnish, grease, oil, dirt, rust, or corrosion products. They prevent the flux from acting and the solder from alloying with the parent metal.

(2) Keep in mind that the purpose of the soldering iron or torch is not to melt the solder but to heat the work until the solder will flow when applied to the work.

(3) Keep the soldering iron clean and, to have the quickest possible heat transfer from iron to work, have the tip designed actually to fit against the work.



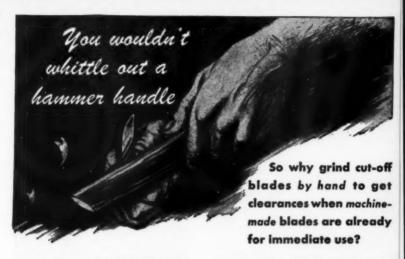
CUT SET-UP TIME IN HALF WITH . . F & H UNIVERSAL VISE!

Just dial the angle. • For grinding compound angles as easily and quickly as simple angles. Suitable for drilling, light nilling and other machining operations as well as for layout work. • Available with grinding wheel angle attachment. • Vise may be had with 2", 4" or 6" jaws.

IMMIDIATE DELIVERY

For Clamping Odd-Shaped Pieces. • F & H Equi-Hold for instant clamping of work pieces with unparallel planes. Consists of two friction plates, jointed together by ball and spring socket. • Write for complete information to:

F & H MANUFACTURING CO. 10338 Gratiot Ave.,



Your operators need not spend valuable time grinding cut-off blades for clearances. Why waste this time-cause unnecessary machine down-time-waste critical materials?

Empire Tool Company's Luers Patented Cutting-Off Blades are scientifically designed to provide maximum clearances not only at the side and back, but also on the top where the hollowground shape causes chip to collapse and relieve the pressure against sidewalls.

These clearances-already "built-in" the blade

-mean increased production. No time is wasted in sharpening. The blade being topered its full length, the back clearance remains constant for the entire life of blade through all sharpenings. Side clearance never disappears because the blade is T-shaped.

These are only a few of the reasons why this. Cutting-Off Blade is gaining such popularity. You owe it to yourself to send for catalog and learn the many benefits to be derived from the use of this unique cut-off blade.



constant side clearance. Only front face is

Expered blades never lose their back trance through sharpening, Blades allef on the langitudinal cutting right recommended for shallow cu slatting, etc. Both topored and paral blades carried in stack

BUY WAR BONDS

Announcing

our appointment as manufacturer's agents

for

FASTCUT CENTERDRILLS

and

WOODBUFF KEYSEAT CUTTERS

TOOL COMPANY MARGINALTHRES LUCES PATERTED CUTTION OF BLADES AND MODES WHERE LICENSE INCLUES BY JOHN MILTON LUESS PATERTS. INC.

MPIRE Tool Co.

8782 Grinnell Ave. Detroit 13. Mich.

The Blades That

(4) Investigate different methods available for doing the work—hotter electric iron, high frequency, or carbon resistance soldering tools may do the job better.

(5) Design your joints to have 0.003 to 0.005" solder thickness, and so that the two parts overlap. Lap or seam-type joints are better than butt-type joints. Have the solder fill the seam completely. Heavy fillets add little strength to the joint, and waste solder.

(6) Don't hand a new solder, a flux, and a soldering job to a workman and expect a perfect job the first time. Let

him get the "feel" of the new material. Don't give up a new solder after one unsuccessful trial—the chances are your technique is not what it should be for that particular solder.

QUICK-SELECTION DRILL RACK

Drill press operators at General Electric's Schenectady Works find this drill holder provides quick selection of the proper drill for the job. Holes in the curved surface accommodate different size drills, and enough space is provided between drills for easy grasping.



SPECIAL SPOT-FACING TOOL

A special hand-operated spot-facing tool developed by J. De Fillippo, a workman at General Electric's Schenectady Works, overcomes difficulties encountered in obtaining a smooth seat for nuts and bolts thru split hubs on rotor spiders. Using the spot-facing tool is slightly more expensive than the chipping method formerly employed, but it does a superior job. Chipping left a rough surface no matter how carefully it was done.



 Several sizes. Direct and belt drives, handling one or several different jobs at same time, Silent. Powerful. Dependable.

 Exhaust and induced draft blowers to solve air-moving jobs quickly, easily, economically. Shipped ready for installation.

Ask for Bulletin A.

Grand Rapids Die & Tool Co.



| 5 holes in | 5 minutes! with the moore jig borer



Fifteen 3/32" holes, spaced evenly .500" apart, are spotted, drilled and reamed on a template of \(\frac{1}{2} \) ground stock, to a tolerance of .0002"—in less than fifteen minutes. In less than sixty seconds each hole is accurately located! If one boring cut were to be made, in order to increase the accuracy to .0001", the time for all fifteen holes would be increased by only 5 minutes.

The Moore system of coordinate location, plus Moore super-precision-ground lead screws are the answer.



PARTNERS IN PRODUCTION . . The Moore Jig Grinder, incorporating the same accurate, rapid means of location, corrects hole distortion after hardening. Modernize your toolroom operations! Write for details!

MOORE SPECIAL TANKS TOOL COMPANY INC

740 UNION AVENUE, BRIDGEPORT, CONN.

DRILL MORE HOLES IN THE AXIS BY KEEPING ALL SMALL DRILLS SHARP — ACCURATE CUTTING BLACK DIAMOND DRILL GRINDERS



FOR SMALL GAUGE AND FRACTIONAL DRILLS

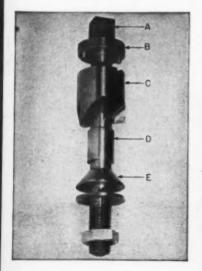
ONE Black Diamond Drill Grinder, in any average Plant, will meet all production demands for accurately ground Small Drills.

On this machine, any apprentice becomes a skilled operator...can produce quantities of sharp drills, ground to perfection... with lips of uniform length...correct angle...proper clearance for accurate drilling.

Black Diamond Grinders cut grinding costs . . . save expensive drills . . . reduce breakage . . . release skilled labor for more important work . . . and the Web Thinning attachment efficiently cares for Notched, Colton, or Crank Shaft Points.

If you use small drills, singly or in gangs—you are losing time and money unless you have a Black Diamond on the job.

BLACK DIAMOND SAW & MACHINE WORKS, INC.
45 NORTH AVENUE
NATICK, MASSACHUSETTS



The holes in the hub are inaccessible with ordinary spot-facing tools. The tool devised by De Fillippo is built up on a shaft slightly smaller than the hole thru the hub. The shaft is turned from 2½ stock. One end is made one inch square for 1½" (A), where a ½" plate fitted with two ¾" pins is left (B). The balance of the shaft is turned one inch in diameter and threaded on one end. Next, a



NEW! WET-CUTTING MODEL FOR ULTRA HIGH SPEED METAL CUTTING JOHNSON **METAL CUT-OFF BANDSAW Dry-Cutting** Model Also Available CAN ALSO BE ADAPTED TO EXISTING JOHNSON DRY-CUTTING BANDSAWS

The Johnson Coolant Model offers unusual advantages for production requiring exceptionally high-speed \dots on some jobs increases as high as 200% can be attained \dots Longer blade life assured!

- ★ NO SEPARATE MOTOR RE-QUIRED — one power source does cutting and operates coolant pump. No special wiring or switches necessary.
- ★ COOLANT FLOWS AUTOMATIC-ALLY — Machine speed controls flow of coolant in direct proportion to speed of blade.
- ★ BLADE WIPERS remove coolant after cutting; no danger of bearing lubricants.
- ★ PUMP SHAFT runs on bronze bearings, quietly, efficiently; handles any cutting fluid.
- ★ DRY CUTTING may be handled by simply disconnecting pump.

JOHNSON MANUFACTURING CORP.

ALBION, MICH.

Write today for descriptive literature to

SALES OFFICE, 5006 CHRYSLER BLDG., NEW YORK

Have you sent for a FREE SAMPLE of the NEW TAMMS LAYOUT DOPE in Blue, Black, Orange, Red?

Speeds layout time on brass. aluminum, copper, tin, stain-less steel. Oil resistant. less steel. Oil resistant. Won't chip, crack, or flake off. Comes in handy 8 cs. bench type brush-in cans. Also pts., qts., qals., drums. Write

Tamms Silica Co. 228-HM North LaSalle Street

CHICAGO, ILL.



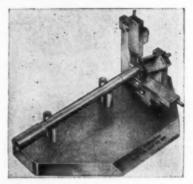
21/4x21/2" cutter (C), slotted on top for the 1/4" pins, is slipped onto the shaft and the shaft thus assembled is slipped thru the hole in the hub. Then a bearing sleeve (D) to fit the shaft and the inside diameter of the hole is put in place, followed by a bearing cone (E). Threaded end of shaft is slotted with a keyway to hold a washer and a nut in place, thus completing the assembly.

Motive force is applied with a ratchet on the square end of the shaft while cutter is tightened by means of the cone, washer, and nut. When one surface has been spot-faced, the assembly may be reversed to finish the opposite seat.

SPEEDING INSPECTION

Seeking a method of speeding up final inspection of draw punches Salsbury Corp., Los Angeles precision grinding specialists and manufacturers of Salsbury Super-Cycles and Power Units for Salsbury Turret Trucks, have developed in their own shops a final inspection gage requiring only one-sixth of the time formerly needed for checking draw punches.

This gage, known as No. 508, consists of a machined base approximately 14" long on which are mounted the necessary



tool supports and three Koch Test Indicators.

The tool which this gage was designed to test is a precision ground draw punch, having three tapers. Checking the diameters on these tapers formerly required three separate micrometer readings by a trained inspector. These three operations are now done at one time by a

FAMCO ARBOR PRESSES for Precision Speed on Production and Assembly Jobs

Exclusive adjustable gib assures perfect ram alignment. 32 stock sizes, floor and bench models, 1/2 to 15 tons pressure. Write for complete data.

> FAMCO MACHINE COMPANY 1320-18th St., RACINE, WIS.

mco and





SMOOTHER SURFACE FINISH

L & I reamers have a cutting edge that is keener because it is ground on both faces.

LONGER USEFUL LIFE

L & I reamers are carefully lapped after the flutes have been ground.

EXTREME ACCURACY

The L & I process eliminates the distortion of flute structure that frequently occurs in the heat treating of small diameter, milled-flute reamers.

STRAIGHT FLUTE REAMERS IN DIAMETERS UP TO 1/4"

LAVALLEE & IDE, INC.

CHICOPEE, MASS.





Pantographic ENGRAVING... ETCHING... MARKING

Do all three with one machine...the PANTO

A COMPACT precision bench-type pantographic machine, with interchangeable heads... for engraving instrument dials, name plates, etc... and for acid etching or electrically marking tools and parts—heat-treated or annealed— on flat, concave, or convex surfaces.

> Write for literature

H. P. PREIS ENGRAVING MACHINE Co. 157A Summit St. Newcrk, New Jersey

WAR PLANE SPECIFICATIONS REQUIRE TOROUING

Modern manufacturing methods call for controlled "settings" of vital nuts, screws, bolts, hydraulic fittings—of almost all threaded parts. Leading American aircraft and engine builders almost universally use the permanently accurate STURTEVANT TORQUE WRENCHES for innumer-

WHENCHES for innume able applications ranging from building precision in struments to testing frictional drag in controls and motors. So models, expecities ranging from 0 to 5 inch pounds on up to 7200 inch pounds.

Write for catalog

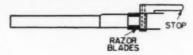


woman, simply by laying the tool on the gage and checking all three diameters at once. By adding additional indicators, as many simultaneous inspections as needed may be made. The gage is not necessarily limited to checking draw punches, as it can be readily adapted to other tools.

The gage is not for sale. Salsbury officials explain that they developed it to meet their own production requirements. By publicizing its money-saving and time-saving features they felt that other manufacturers with similar production problems might be able to use the idea.

CUTTING-OFF PAPER TUBING

A special tool using razor blades, devised by H. E. Tibbetts, a General Electric foreman, reduces cost and speeds operation of cutting cardboard insulation tubing to size for aircraft motors.





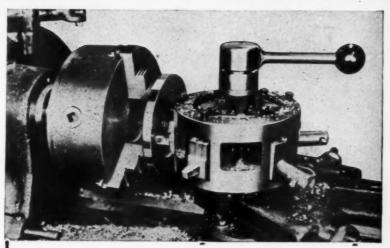
CUT OFF TOOL

Short lengths of small diameter tubing must be cut into two pieces for the motors, and as previously done by hand the operation was a slow one. In Tibbett's method, the tubing is chucked in a collet with a backstop on a small bench lathe. Stop on the tool is brought up against face of the tube. Then by bringing the cutting edges of the two razors against the tube's outside diameter, it is easily and quickly cut into two pieces of correct size.

The razor blade nearest the stop cuts a small section off the end of the tubing. It is set ahead of the other blade so that its operation will be completed before the tube is weakened by the second cut. The second blade cuts the remaining piece in two.

REFRIGERATING COOLANT

A practical and economical method of chilling the coolant oils during high speed surface grinding is reported by the McCroskey Tool Corp., Meadville, Pa., manufacturers of machine tools, accord-



For Real Production Increases:

LATHE TURRET 5 Station Oscillating Tool Block.

Use your present Engine Lathe equipment—give it turret lathe versatility and productiveness by installing this modern 5-station Automatic attachment on your compound.

An eighth turn of the handle and a lift to a 45-degree position releases the turnet head so that it may be turned to any one of the ten positions allowed by the indexing. Indexing is accomplished accurately with a crown clutch arrangement, eliminating any manual lifting of a pin and assuring sustained accuracy. Tool bits may be rotated as well as tilted in any position, allowing for more precise settings and top cutting efficiency.



WRITE FOR

DETAILED FOLDER

Box 14, Auburndale, Mass.

ing to J. C. Tweedell, Field Manager for York Corp.

Chilling the coolant oil to a constant temperature is said to enable continuous operation of the machines for the first time. This saves time of skilled labor, and war-scarce oil which oftimes can be re-used. Life of machines is prolonged.

This refrigerating system, installed by the Apfel Engineering Co., is designed to maintain a constant temperature of 60° during the whole period of grinding. It utilizes a York self-contained cold well water cooler.

LINE-UP ARBOR

In assembling stator lamination stacks for small instrument-type motors in manufacture at one of General Electric's plants, difficulty in aligning punching slots has been greatly decreased by the use of an intermediate transfer arbor. The transfer arbor aligns the punchings from the inside of the slot so that the more accurate press arbor can be slipped into the bore, picking up the alignment as it travels, and permitting the lamination stack for the entire stator to be assembled



at once. Savings of 75 per cent of stacking time have resulted from the use of these intermediate arbors.







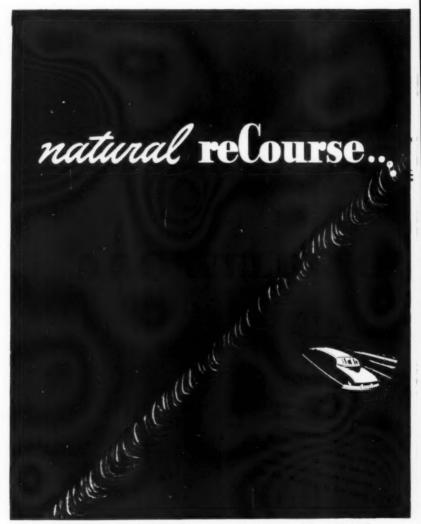
It's about the kind of thread and form milling cutters you've been looking for. Also—"Hints on Sharpening Thread and Formed Milling Cutters." A free copy on request. Write Dept. A.

PLAN-O-MILL CORPORATION

ISTT EAST EIGHT MILE ROAD, HAZEL PARK, MICHIGAN

America's greatest

THE LINCOLN ELECTRIC COMPANY . CLEVELAND, OHIO



Recourse: According to Webster, "a going to for aid or protection"

Zuick Delivery! OF QUALITY **CUTTING TOOLS** if it's an Arnold it's accurate

Many of America's leading manufacturers ave learned that most of the quality cutng tools listed in the new Arnold catalog an reach them surprisingly fast. For inance, three types on which you can exect almost immediate delivery are illusated above. They are: counterbores, raight and taper shank with interchangeble pilots and Woodruff key seat cutters. rnold's thirty years of toolmaking expeence can provide you with cutting tools at can be depended upon for maximum fficiency, service and accuracy. If you do ot have our new 40 page catalog containag the complete Arnold line, send for it at nce. No obligation.

Western Representative
JOHN HENLE
210 West 7th Street, Tel. Madison 4221
Los Angeles, California





New Allison Collet Chucks speed production—reduce rejects —give full spindle hole capacity on lathes up to $1\frac{1}{2}$ " size.

Unerring accuracy on all types of metals and plastics—exacting tolerances easily maintained as entire chuck assembly extends but 2 inches beyond spindle. Requires no keys, wrenches, reverse switching or stopping at any time during operation. Only collet and nose seat revolve—collets can be easily and

safely changed while lathe is in operation. Immediate delivery on Allison collet chucks and Allison collets—round, hexagon, square and serrated. Order direct from your distributor.

ALLISON TOOL & ENGINEERING CO. 4031 Whittier Blvd. Los Angeles, Calif



systematizing Avoids Penalties In Tax Deduction Recordings

By ARTHUR ROBERTS

These instructions, if followed, will save penalties and expense in making up payroll. Many scatter their tax deduction recordings all over the books in different accounts. By using a combined system, they will effect economies and minimize errors.

Editer.

BECAUSE the current tax payment Act of 1943 adds considerably to tax repreding routine, which, in many concerns, as a big burden before the Act was ussed, users of tools and machinery must we this phase of operation more thought an formerly to save expense and insure curacy. Tax deductions are so numeras now and involve so much work that the employer must do a more systematic b of it than heretofore if he wishes to roid penalties. It is no longer good praccet od draw one check for payroll and set the total in one lump sum to the

payroll account. So many taxes must be taken out of each employe's pay that the employers in this field, large and small must record the exact breakdown to keep in the clear. The government insists upon accurate recordings and unless the employer installs an efficient tax-recording and tax-filing system, he will have trouble. Then too, the employer must furnish the employee with a written statement showing wages paid and the amount of tax withheld on or before January 31 of the succeeding year, also upon severance of employment. He must furnish the Collector of Internal Revenue a statement showing wages paid each employe during the previous calendar year and the withholdings. Duplicates of these statements. if filed with the Collector, will supersede Information Return Form 1099, which is required otherwise to be filed by February 15 of the year following payment of

TAX DEDUCTION

Date	HO! Regular	Overtime	Regular	WAGES Overtime	Other	TOTAL
Add: Socia With	ress al security number tholding exemption or Tax exemptions	er	**************************************	2 s m avec	YEAR	***************************************

the wages. The withholdings on Income and Victory taxes must be paid to the Collector or a designated depository but it is not necessary to itemize the tax for each individual employe.

The Treasury Department has completed arrangements for banks to act as depositories for withholdings. Hence, all employers withholding more than \$100 during a month, must deposit this money in a local bank authorized by the government. All banks insured by the Federal Deposit Insurance Corporation are eligible and more than likely will cooperate. Deposits must be made within 10 days after the close of each calendar month. The employer may, however, include with his return, the taxes withheld during the last month of the quarter instead of depositing same in the bank. The employer will get receipts for his deposits which he will mail, in lieu of cash, with his return. In addition, the employer must report the quarterly wages paid employes to the Federal Old Age Benefit and State unemployment compensation offices.

Quite obviously, this involves more book-work than was needed in the halcyon days when taxes were less of a headache. Unless steps are taken to systematize and group this data properly, the employer will find himself in a bad way if asked to furnish proof of his figures, Besides, the extra work will increase his expenses at a time when expenses should be curtailed. One concern with 250 employes estimates that their payroll work now consumes four times the man-hours of a few years ago and they have 15 people making out reports to the local, State and Federal authorities, whereas, they formerly had one. The user of tools and machinery, therefore, must take steps to save time on such work, otherwise, it may prove a heavy expense.

To effect efficient recording, I suggest that you purchase a special form for social security, wage and hour, withholding, Victory Tax and other deductions from the wages of employes. Any stationer should have these forms, which will fit in a standard loose-leaf ledger or post binder. These forms are big timesavers because, by grouping all tax deductions on one page, they simplify recording, analysis and the filing of reports. Select a form that best suits your requirements. If your turnover is low and wages paid weekly, get a form that eliminates the re-writing of employes' names each payday. A user of tools and machinery, with many employes, will hardly be able to use a form that will suit the smaller user. There are so many variations of requirements in this field that I cannot offer counsel as to the payroll form to use. More than likely, the form will have to be specially prepared for the large plants by an expert on systems, or the company accountant. I will caution, how-

FORM

Type word	
Wages paid	
Payroll period	*************************
Employment terminated	

FOA	w	VT	TOTAL DEDUCTIONS	WAGES

ever, against the use of card systems. I have audited payroll departments using cards alphabetically arranged and often could not find records because they were lost, strayed, stolen or mis-filed. Losing tax records is a more serious matter than losing ordinary payroll records. Hence, I suggest that large plants make their recordings on ledger sheets securely fastened in a binder. No employer can afford to scatter tax deduction recordings all over the books in different accounts.

Keeping the Record Straight.

The record form reproduced is a good sample to follow. You can make up forms to suit your specific needs, as explained.

When remitting to the tax authorities, total these deductions for the period, rule off with a red line, and start over again, noting date of mailing Form W-1 upon which this return is to be prepared, the number of receipts and amounts and check number if remittance is made direct. File all data pertaining to the return in Tax File. The blank columns are for inserting tax deductions other than Federal.

THE SAME PAIR OF KNURLS PRODUCES MANY PATTERNS



ADJUSTABLE KNURL HOLDER



Many unusual features give this Knurl Holder many unusual advantages. Shank is made to fit turnt (or tailstock). Capacities up to 2½" diameter of work. Operates like a screw die. Learn its possibilities for YOUR work.

Request Illustrated Price Circulars

GRAHAM MFG. CO.

54 Bridge St.

East Greenwich, R. I.

Organizations having eight or more employes for 20 or more days during the calendar year, each such day in a different calendar week, must file return on form 940 under Federal unemployment compensation. But, altho you have less than eight employes and need not file a Federal return, you may be subject to your state unemployment compensation law, which may apply if you have only one employe.

Then too, the new Act states that a deduction for State compensation is wages even tho you pay the tax, hence, this deduction should be entered on the Tax Deduction Form.

You may adjust this form to suit requirements, maintaining the fundamentals. FOA stands for federal Old Age, W for withholdings from income and VT for Victory Tax.

Many concerns have switched from paying wages in cash to paying each employee by check. The user of tools and machinery will find this a big help in recording tax deductions. Mark the deductions on the check or stub so that you have a clean-cut receipt for each withholding. Let's hope that someday the government will combine all Federal taxes into one, so that just one deduction is necessary from wages and likewise when computing the tax on income.

Another aid to recording is a "Tax file", in which place all receipts, duplicates of returns and other data pertaining to tax. Do not depend upon memory. Make a record of all tax business in sufficient detail to be able to give a lucid explanation to government auditors. Otherwise, there will be penalties. Keep a tax calendar showing when payments are due and when mailed, also when reports are due.

Kecp the tax money in a separate account or see that you do not use these funds in business. Some employers, in the past, have used social security deductions in their business and then had to dig down to settle on the due date. This tax is comparatively small, hence, they were not inconvenienced financially to any considerable extent. But the withholdings for all taxes today are much larger and you'll be in a tight spot if you don't have the money to settle when Uncle Sam says—"Come across".



STOCK DELIVERY

Wetmore standard Reamers are now available from stock for quick delivery; and unusually good delivery is made on boring bars and special tools. Phone, write or wire.

WETMORE REAMER CO.

418 N. 27th St. o Dept. MILWAUKEE 8, WIS. With Wetmore inserted-blade adjustable Reamers, blades may be set out 7 to 50 times, depending on the size of the reamers. Adjustment ranges from .034" on 5/8" diameter reamers to .420" on 3-7/16" sizes and larger. This feature saves time and tool cost. Wetmore Boring Bars can be accurately set to the thousandth's of an inch in a jiffy, even with inexperienced help, by means of the graduated adjusting screw.

all over the country.

The combination of design features found in no other Reamers and Boring Bars enables Wetmore tools to take faster and larger cuts... maintain close tolerances... produce absolutely smooth holes... and last longer. These features add up to lower machining costs and less spoilage.

WRITE FOR CATALOG





ENGINEERED LIVE CENTERS

A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications—we will see that your job gets set up with the right Live Center. Standard shanks with Morse taper carried in stock.

STURDIMATIC TOOL COMPANY STURDIMATIC S220 THIRD AVE., DETROIT, MICH.



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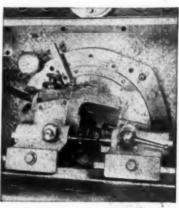
WHAT'S NEW IN METALWORKING

NO. 4 FELLOWS FINE-PITCH GEAR SHAVING MACHINE

THE Fellows Gear Shaper Co., Springfield, Vt., offer a new Shaving Machine adapted particularly to the shaving of small fine-pitch gears. This machine will handle gears up to 4" pitch diameter, and 20 diametral pitch, and finer. Work is held on fixed centers located in adjustable head-and tail-stocks. According to this company's experience, "fixed" centers are preferable to "live" centers for small diameter fine-pitch gears, for the reason that greater concentricity is obtained.



Front view of No. 4 Fellows Fine-Pitch Gear Shaving Machine with guard lowered to show tool, work, slide, etc.



Close view showing work-slide and toolhead. Also vernier scales for setting crossed-axes angle.

On this particular machine, work-slide, instead of shaving tool, is reciprocated. This reciprocating movement of the work-slide is imparted by a unique type of crank mechanism, which slowly traverses work across the shaving tool. The work table is adjustably mounted on this slide so that it can be set for correcting taper.

The head carrying the shaving tool is adjustable for crossed-axes setting, having a maximum angular movement of 20 degrees both sides of center. A scale for degrees, and a vernier for minutes are provided for the angular setting of the tool head. Provision is also made for using a dial indicator for finer settings.



Sheldon BBU-1240 WQ Precision Lathe

This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a standard 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.

If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE CO., INC.

4242 N. KNOX AVE.

CHICAGO 41, U. S. A.

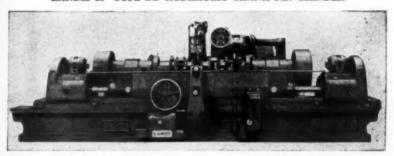
The machine is provided with complete electrical push button control, both for operation of the tool and the reciprocation of the slide. Accurate means are also available for setting the tool relative to the work. A dial graduated in 0.005" is available. Once the machine is set, of course, the proper depth is maintained by means of a depth feed cam. The toolspindle is driven by a separate motor

mounted in feed slide. The motor which drives the work-slide, also operates the compound pump, and is provided with a plugging switch to prevent coasting of the slide. The machine is automatically lubricated by Bijur lubricating pump.

The principle capacities of this machine are:—Maximum pitch diameter 4"; maximum diametral pitch 20, and face width

1".

LANDIS 25" TYPE DD HYDRAULIC CRANK PIN GRINDER

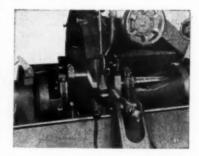


Recent demands for close accuracy coupled with high output have led to development of a new Landis 25° Crank Pin Grinder. In the shorter lengths, it is recommended for both single and doubte throw radial engine crankshafts and for in-line liquid cooled engine crankshafts. Smaller Diesel engine shafts may be handled by the longer length machines.

A principal feature is the dual work drive arrangement. This is claimed to eliminate or minimize objectionable axial deflection in crankshaft. Speed of the two work drive motors is synchronized electrically. All multiple V belt drive speed reduction units at each end of table are coupled by a large diameter drive shaft, the drive from which is thru chains and sprockets to the two work spindles. Both work heads may be moved transversely on top of work table by means of rack and pinion arrangements. Shafts of varying lengths, as a consequence, may be handled by same machine.

Work heads are of extra heavy design, which is important when shafts of considerable weight have to be handled. A unique method is employed to correct any out-of-balance condition in crank-haft. Two balancing weights are mount-

ed on a circular plate attached to outer end of each work spindle. These weights may be moved radially in a T slot. Fixture aligning latches are provided to hold the two work fixtures in alignment during unloading and loading.



A rugged shoulder grinding attachment is supplied for crankshaft cheeks. Control is by a handwheel close to feed-up handwheel. Graduations in tenths enable operator to gauge extent to which he is feeding wheel sidewise. Total movement is \%" and wheel may be fed in either



Girl operator precision grinding 1/2" dla. 2-Flute High-Speed Steel End Mills, sharpened to a 15° cutting angle. Total time required to grind catter from hardened and and ground blank is 5 minutes per catter.

Saves Time and Money...with a

This manufacturer has four Gorton 375-2 Cutter Grinders for sharpening cutters and mills used on a number of precision machines, including three Gorton Pantograph Engravers and a Duplicator.

Girls operate all four grinders. It requires only about two months to develop a girl's skill sufficiently to perform the most critical grinding operations on most types of precision cutters and end mills.

ACCURATELY GROUND TOOLS are indispensable to Super-Speed precision milling. The Gorton 375-2 Cutter Grinder grinds cutters with 2, 3 or 4 flues, or flast...am diameter, taper, radius or clearance within the capacity of the machine. With diamond impregnated wheels (interchangeable with standard wheels), fungsen carbide cutters can also be ground.

OUR GOLDEN ANNIVERSARY Install a Gorton 375-2 Cutter Grinder for increased accuracy and production with smoother finish in your milling operations.

No. 375-2 Grinder, equipped with No. 717-1 Universal Tool Head and No. 9761 Pedestal, complete, ready to operate

\$612



This convenient rach is furnished free with assortments of Goroon Custers and End Mills. Savet time and money or

FREE

For complete details and additional accessories write for Gerten Accessories Catelag offering 580 aids to pro-



BEDREE GORTON MACHINE CO.

1317 RACINE STREET, RACINE, WISCONSIN, U.S.A.

FOR OVER 50 YEARS Specialists in "Tracer-Controlled" Mark

direction. The attachment is not intended merely for slight truing up of cheeks but for rapid removal of as much metal as

may be required.

Shafts are rigidly supported by a rugged bed mounted stationary work rest. A quick acting lever permits bringing both shoes into operative position and also to drop them to inoperative position. With shoes inoperative, the work table may be traversed without danger of incerference between crankshaft flanges and shoes. Hand adjusting screws are provided for final adjustment of shoes.

The hydraulic straight infeed mechanism is of same basic Landis design used in other Landis equipment. Because of the large flanges inherent in design of many airplane crankshafts, it is necessary to feed wheel back a considerable

distance to obviate interference during work traversal. On these m achines, amount of rapid feed is 12". A grouping of three controls at front of machine permits ready control of direction of feed and adjustment of speed of both fast and slow feeding movements. Landis Microsphere wheel spindle bearings are used and a 48" diameter grinding wheel is considered standard.

The Type DD is available in four size s:—namely 25"x48", 25"x80", 25"x90" and 25"x120". Each of the work drive motors is one hp, while wheel drive motor is 25 hp. Net weight of the 25"x48" size is 33,860 pounds indicating the general massiveness of machine which is made by Landis Tool Co., Waynesboro, Pa.

CINCINNATI HYPRO FROG AND SWITCH PLANER

Development of an improved Frog and Switch Planer is announced by Cincinnati Planer Co., Cincinnati O.

It is designed primarily for Hypro-duction and maximum rigidity in withstanding the heaviest cuts, having a double length enclosed bed with extra deep housing cheek bearing to the bed. A full length box section arch adds to rigidity of housings. A wider V spread to the bed and table is provided. Table is of greater depth and is provided with full length hold down gibs.

The combination herringbone balanced drive runs smoothly under heavy cuts and is built to carry 100 hp. All shafts are of large diameter with hardened, ground and lapped journals. All gears are of steel and hardened. Heavy walled bronze bushings are used thruout drive train.

Tool blocks, clapper boxes and clamps are of steel. The Hypro tool block abutment relieves strain from clapper box pin. A self locking worm is used to swivel

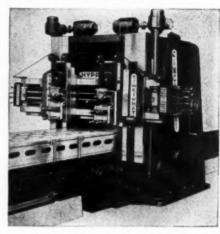
clapper box.

The rail and down feed screws are of extra large diameter. A long bronze nut is mounted near top of slide, accessible for taking up backlash. Counterbalanced inverted dovetail slides prevent dropping of slide and consequent hammering of screw in the nut as tool strikes the cut.

Rail heads are mounted on a square

gibbed narrow guide cross rail.

A feed and traverse sealed unit with



hardened gears and clutches, all shafts mounted in anti-friction bearings running in a bath of oil is said to provide exceptional convenience and flexibility of directional controlled traverse and feed.

Instantaneous rail lift is optional equipment. Heads and slides can be fed and traversed in any direction, independently or together. There is a special jogging device for feeding tool into work for tapering and trimming as table moves in the cut direction.

Both heads may be moved manually in either the same or opposite directions simultaneously, with a single crank.

Any ANGULAR GRINDING SET-UP



Can Be Completed QUICKLY, ACCURATELY With MAGNA-SINES

Magna-Sines are adjustable in a few seconds time to any angle . . . either single or compound . . . with assurance of accuracy to gage block limits. A flip of the switch and work is held magnetically with no possibility of it changing position during grinding operations.

Write For Full Information



The MAGNA-SINE

ROBBINS ENGINEERING COMPANY

October, 1943

MACHINE TOOL BLUE BOOK

25

PRATT & WHITNEY BENCH MILLERS

A compact bench size milling machine known as No. 3 Model C has been developed by Pratt & Whitney, West Hartford, Conn. It is said to incorporate the features and flexibility of larger floor-type millers. Designed as a companion piece to the well-known Pratt & Whitney T'' Model C bench lathe, the machine is said to be capable of turning out the utmost in precision milling work within its capacity range. An advantage is the fact that parts from the lathe and the milling machine are interchangeable. Col-

lets, arbors and many other special attachments are transferable from one machine to the other. The complete headstock may be moved from the lathe onto the milling machine with the work in position, undisturbed. Frequently these companion machines are mounted together on one long bench.



DEBUR)

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Are available in several styles and models: Stroke, Rotary, Predetermined, Electric, Conveyor, Wire Measuring . . they're ruggedly built, accurate, dependable . . speeds from 400 to 5,000 counts per minute. Send your problem to us . . our recommendations are backed by 64 years' experience in the manufacture of counting devices.

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DURANT MANUFACTURING CO.

. 1928 N. Buffum Street

180 Eddy Street

Micrometer dials are graduated in thousandths and suitable binders are provided for both knee and saddle movements. Dovetails are equipped with adjustable gibs to compensate for wear.

Table can be swiveled to any angle up to 45 degrees, either side of center. It also moves longitudinally along top of

SUPERIOR QUALITY AND WORKMANSHIP IN PLUNKET VISES



SQUARE BASE SHAPER VISE

The Shaper Vise has graduated swivel base and tongue in center to fit slot in table, and has holes for bolting down. In ordering this vise give size of slots in Shaper Table, also distance from center to center of slots.

a. 41, 12° jaws, 2½° deep, opens 8½°. Weight 125 lbs....\$52.0 O No. 4, 6° jaws, 1½° deep, opens 5°. Weight 45 lbs.....\$38.00 Our complete line includes Vises for Drill Presses, Milling Machines, Shapers and Grinders.

Prices are net, f. o. b. Chicago, Write for illustrated folder today, Dealers inquiries solicited.

J. E. Plunket Machine Co. Chings 12, 14.

AUTOMETRIC
18" English
Measure,
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GAUGE

Now Available

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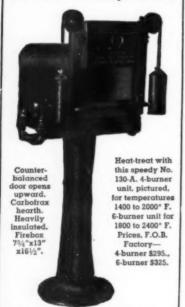
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the saddle on an accurately straight dovetail bearing. A 10-pitch lead-screw and ballcrank handle actuates its travel.

The heat-treated, accurately ground spindle is hollow to accommodate drawback mechanism. At the front it is mounted on two precision preloaded ballbearings, opposed to take the thrust in either direction. The rear bearing is a single precision radial ballbearing mounted so that it can shift or float to find its proper running position. All bearings are permanently lubricated and sealed.

A master electric speed Ranger drives the spindle thru multiple V-belts. This is a variable speed unit, mounted under bench or in cabinet where it is out of the way. It provides an infinite number of spindle speeds ranging from 125 to 2250 rpm. The speed collector is a remote control unit mounted conveniently on bench beside machine. Speeds are group-ed in two ranges and both are available in either direction. There are no belt changes and no gear changes.

The universal indexing head is practically the same standard device that has been used for years on floor-type millers. Spindle of the indexing head takes the same size collet, centers, etc., as the ma-

chine spindle.

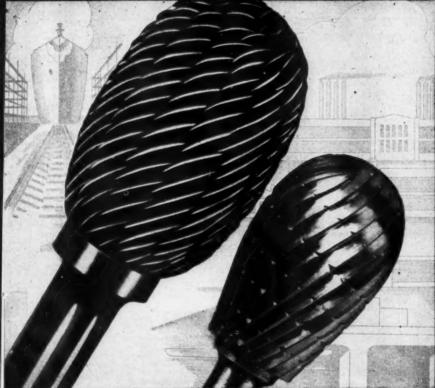
Table working surface is 18x2%"; longitudinal table travel is 9¼"; transverse table travel is 35%". Center of table to end of spindle is 43%" maximum; center of table to end of spindle is 3%" minimum. Vertical movement of knee is 85%"; bench space required is 24x32x26". Weight of prochine with results as the space of the space is 24x32x26". machine with regular equipment is approximataely 185 lbs. Regular equipment includes machine with overhanging arm; drawback sleeve and hand-wheel; preloaded ballbearing spindle driven by multiple V-belts; two table stops; one knee stop; three arbors, one each 1/4, 3/6 and 1/2": and a set of wrenches. A wide range of additional equipment and attachments may be added.

ALLEY PORTABLE SHEARS GUARANTEED Two Sizes No. 1 cuts up to No. 11 gauge strip or sheet. No. 2 cuts up to 1/4" steel plate. Special Blades for shearing stainless steel.

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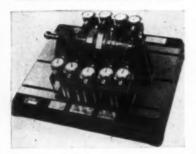
MACHINE WORKS

HARDWARE DIVISION

4539 WEST LAKE STREET

CHICAGO 24, ILLINOIS

MULTIPLE INSPECTION GAUGE



An interesting example of multiple gaging is shown in the illustration. Nine diameters are being checked simultaneously. The instrument can be adjusted to crankshafts of other sizes and lengths. The setup shown is adjustable to any length of shaft up to 12" and can be furnished with gaging units to accommodate any diameter up to 4". The shaft is mounted between centers so that it can be rotated, permitting all the diameters of the rotor to be checked easily. The gauging unit and bracket housing the centers are designed to slide in Tslots in the base. Thus diameters anywhere along the entire length of the shaft can be accurately checked.

This gauge is one of many types developed by Federal Products Corp., 1144 Eddy St., Providence, 1, R. I. Bulletins giving complete information on many types of gages are available on application.

ALL-WOOD SAFETY MATS

An attractive four-page bulletin illus-trates and describes the line of all-wood Safety Mats developed by the Ton-Tex Corp., 118-24 West 22nd St., New York City. Made of non-critical wood, these Mats provide foot comfort and safety for workers on the production lines. Folding into compact units, the Mats are ex-tremely flexible in application, folding up into compact units for ready portability.

If you want them back— Back them up-BUY WAR BONDS!



"CHAMPION" Steel Racks

Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

Write for full details.

The Western Tool & Mfg. Co. Springfield, Ohio





Specifications

Heavy enough for production work (over 6 feet high, weight close to 700 lbs.). Wheel $7 \times \frac{1}{2}$, $1\frac{1}{4}$ " bore; minimum cup wheel $3\frac{1}{2}$ " dia.

Capacity (under 7" wheel) 9½" to table – 6" to Brown & Sharpe No. 510 Magnetic Chuck (not furnished).

Maximum surface that can be ground: Length 13¹/₂", width 6" (table surface 5³/₄ x 13). Hand operated.

Traverse feed, one graduation is .001". Coarse vertical adjustment (wheel at top

left), 9½" range.

Micrometer adjustment ¾" range, each graduation is .0005".

Two spindle speeds: 3200 or 4200 r.p.m. with 60 cy. motor.

Drill Presses -Grinders - Cut-Off Machines - Bond Saws - Abrasive **Finishing Machines** machine for the money." say delighted users

You make a big saving on initial cost - and get dependable, trouble-free results over a long, useful life-with this husky, big-capacity grinder. It is ideal for surface grinding, tool sharpening, etc.

Designed for speed and ease of operation. Convenient controls . . .

wide graduations on micrometer for close settings . . . unique wheel adapter that saves on "truing-up" operations . . . many other features that assure you of creditable performance.

Call your industrial distributor (Delta sells only through distributors) today, Write for catalog.

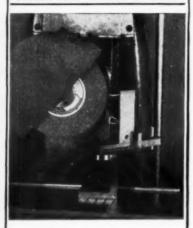
no. 24-105 \$295.00 f.o.b. Milwaukee without wheel, motor, or switch. PD-1A priority required.

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An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in horizontal position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two Brazilian 1/3 ct. diamonds and instrument case included.

It readily produces: Any desired angle; Convex radii to 4"; Concave Radii to 7". On 7" wheel.

Specifications: Base 3"x3", height 8½"; Wheel capacity 8"; Angular travel 3".

For information or a demonstration CALL YOUR SUPPLIER.

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PRECISION DRESSING TOOLS

J. & L. OPTICAL COMPARATORS

Precision workers in many fields have learned to depend upon optical projection comparators in high precision work. Some companies may not be fully informed as to the advantages and possibilities of inspection and measurement by optical projection. Accordingly a new booklet has been issued under the title of "Beyond A Shadow of A Doubt". This booklet explains how measurement of tools and gauges and inspection of production parts can be made quickly and accurately by comparison with master template or outlines thru optical projection. This new method has been a great aid in stepping up production in important plants, improving quality as well as effecting savings in cost and materials. Its adaptation is increasing rapidly as people become acquainted with its many advantages.

Pioneers in the field of optical projection inspection in North America, Jones and Lamson Machine Company, Springfield, Vt., publishers of the booklet, have developed a broad range of equipment for this work. This Company is still pioneering in many important fields for application of projection inspection. The booklet gives complete details of the various optical comparators and shows many instances of their practical application to important production problems of today.

MAGNETIC PULLEY "KNOW-HOW"

Better separator performance, with resultant savings in time, material and costs are the aims of a special "know-how" booklet, packed with practical information.

Pertaining specifically to magnetic pulleys, much of the data is applicable also to other types of separators. This is especially true of the section on electrical maintenance.

Bulk of material consists of non-technical information on operation, maintenance and trouble-shooting, with brief discussions of magnetism and magnetic pulleys. Fundamental laws governing magnetism, essential to thoro understanding of subject matter, are given at points in the text where applicable.

Book is aimed also as a refresher for those already familiar with the products as well as for those with no previous experience.

Address Dings Magnetic Separator Co., 100 E. Smith St., Milwaukee.

Back the Attack —
Buy More War Bonds!

INDEX MILLS

Manufactured by Index Machine and Tool Co., Jackson, Mich.

CHECK THESE FEATURES!

- ★ Precision Ball Bearing Spindle that will require no attention for two years.
- ★ Swivel Head which can be set 90° right or left.
 - ★ Super construction sensitive enough to

do work with end mills ½" diameter yet rugged enough to use ¾" end mills taking full cuts 24 hours a day.

- ★ Verniers for locating, and power feed to spindle for boring.
- ★ A versatile machine that can be used in the tool room or on the production line.

Send inquiries for immediate quotation and quick delivery to Factory Sales and Distributing Agents.

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and
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3100 E. MICHIGAN AVE.
JACKSON, MICHIGAN

HIGH SPEED, AUTOMATIC NUT TAPPING MACHINE

The Bodine Corp., 317 Mountain Grove St., Bridgeport, Conn., has perfected a fully automatic nut tapping machine which delivers four nuts simultaneously to four tapping stations by means of two hopper feeding mechanisms, each equipped with two adjustable chutes.

Thus, four nuts are produced per stroke, each nut being discharged to its individual collecting box so that the product of each tapping spindle may be individually gauged prior to its delivery to stock.

If desired, two sizes of nuts can be run simultaneously. Each spindle carries its own compensator which allows tap to follow its own lead, for precision quality.

Spindle drive is thru a positively geared and timed train of gears, (no friction clutches), a principle which is said to eliminate distortion or tearing of threads in the tapped holes.

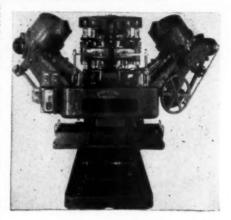
There are two sizes of standard machines—one handling nuts up to and including ½"—28, the other ½"—20.

Both machines may be factory-adapted to include countersinking and tapping; or drilling, counterboring and tapping; by addition of a suitable automatic indexing dial. Thus a multiplicity of operations can be performed on a single blank.

When components are feedable by hopper, a battery of machines can be tended by one operator.

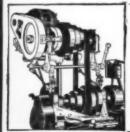
These completely motorized, self contained units require 80"x55" and 80"x80" floor space, respectively.

Production depends upon size of nut and material from which it is made, A



number 10/52 nut, for instance, of X1335 steel can be tapped at the rate of 160 per minute on the smaller machine.





AVOID NEEDLESS NOISE.

You'll find changing speeds a noisy operation with many drives. That is the big difference between a Remco and the others. A Remco is quiet. Motor takes hold gradually by slipping the belt—simple friction-clutch action. No clash, no crash, of metal-on-metal. Instead shockless speed changes made without removing tool from cut in most cases. Less down-time, more out-put! Remco Products Corp., State St. at R. R., York, Pa.

REMCO MOTOR DRIVES

for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.



THE J. C. GLENZER COMPANY, INC. 6465 EPWORTH BLVD.

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This BOOK tells how to speed your Inspections

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war plants now use
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MICRO-CHEKS to speed up the gaging
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PYRO OPTICAL PYROMETER

shows many further uses of this accurate, speedier gage. Write for this information.



Unique construction enables operators to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

THE PYROMETER INSTRUMENT CO. 102-105 Lalayette St., New York, N. Y. SPEEDS SHEET METAL WORK



Recently introduced the Riverside Multi-Flanger is said to offer substantial advantages to makers of sheet metal parts, where flanged edges or strips of more or less intricate contours, are involved.

It is designed to handle almost any practical gauge, and work on straight edges or with equal ease around unusual shapes, such as the edges of disks, or around inside and outside edges of circles. Length of forming operation is unlimited, and there is no scoring, marking or mutilation.

No large dies are required. Head is adjustable to provide wide range of operations. Safety to the operator, whose hands are both free to manipulate the material, is emphasized in the design. Operation is easy, requiring no special skill or experience, the makers point out. Four square feet of floor area are required for installation.

quired for installation.

Bulletin No. 123 may be obtained from the maker, Riverside Machine Co., 10632

S. Michigan Ave., Chicago.

GUS NEY COOLANT PUMPS

Write for descriptive literature

Made in various types and sizes from 1/30 to 2 H.P. Pumping capacity up to 200 g. p. m. Many patented and exclusive features.

THE RUTHMAN MACHINERY CO.
1808 Reading Rd. Cincinnati, Ohio

PROSSER CARBIDE GRINDERS

Modern, streamlined grinders for most rapid rough grinding and finest finishing of carbides, stellite, high speed steel, and other modern tools.

Bench and floor type machines, of several capacities, for wet or dry grinding, as desired. Attachments for chip breaker and drill grinding.

FEATURES OF PROSSER GRINDERS

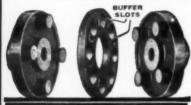
- Quick-acting indexing tables.
- Adequate wet grinding equipment.
- High grade ball bearing spindles.
- Oversize wheels, giving longer wheel life, and permitting grinding of larger tools.
- Moderate price.

Prompt Deliveries Write for Details

Thomas Prosser & Son







A MONEY SAVER

The BUFFER-SLOT COUPLING lengthens the life of your Motor-Driven Machines by absorbing the load shock and constant vibration that gradually wear out machinery and bring on shutdowns and repairs.

BUFFER-SLOT COUPLING

It not only gives you all the advantages of the ordinary Flexible Coupling but it goes a step further and restores that cushion driving torque lost when you discarded Beit Drives. It is long lived, dependable and especially adapted for use with machinery having Ball or Babbitt Bearings. • SEND FOR BULLETIN No. 24.R

BROWN 126 N. THIRD ST.

ENGINEERING CO. 128 A. READING PA

TURRET TOOL POST

Hardened throughout, self-compensating for wear, precision built. For top production on

Wear, precision built. For top production on small South Bend, Sheldon, Clausing, Atlas, Logan and similar bench lathes and small screw machines.

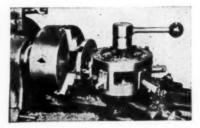


F & M SALES COMPANY, HOLLYWOOD, CALIF. Manufacturers and Selling Agents

AUTOMATIC LATHE TURRET

A rugged, continuous-duty lathe turret is offered by Automatic Machine & Tool Company, Box 14, Auburndale, Mass.

This five station automatic turret attachment provides a ready means of providing engine lathes with turret lathe versatility and productiveness.



A 1/8th turn of the handle and a lift to a 45° position releases the turret head so that it may be turned to any one of the 10 positions allowed by the indexing. Indexing is accomplished accurately with a crown clutch arrangement. There's no need for manual lifting of any pin. Tool bits may be rotated as well as tilted in any position, allowing for more precise settings and top cutting efficiency.

Four sizes are available, the smallest being for 9 to 12" lathes and the largest for 22 to 30" lathes.

A new bulletin illustrates and describes the turret fully and also shows a number of special tools and attachments offered by this company. These tools include standard tool holders and boring bars, cutting-off tool holders, adjustable angle tool bit holders, tool bit bushings, etc.



Artus Spacers

Made of Plastic in thicknesses from .oo1 -.o30. Each thickness can be identified by its color.

IMMEDIATE DELIVERY

Send for detailed circular and price list.

Industrial Products Suppliers 2 Broadway, New York City

Liverything you want







Presses, Metal-Cutting Band Saws, Circular Saws, Jointers, Router, Shapers Grinders, Lathes, Scroll Saws, Flexible Shaft Units, and Portable Electric Drills. Gives full specifications and prices.

Duro Metal Products Co., 2655 N. Kildare Avenue, Chicago, Ill.

Gentlemen: Please send me FREE copy of latest DURO Catalog giving full specifications on new DURO 18-inch Drill Press and other DURO Machine Tools.

MACHINE TOOL DIVISION

ALSO MAKERS OF DURO HAND TOOLS



(R) CIRCLE "R" Metal Cutting Tools

Made by Perfectionists





Also Metal Cutting Saws of all types

CIRCULAR TOOL CO., INC.

CHICAGO • PHILADELPHIA • NEW YORK DAYTON • CLEVELAND INDIANAPOLIS • DETROIT • ST. LOUIS Our combination drills and countersinks are milled on this machine designed by our own engineers. Depth of cut and spiral are automatically controlled, assuring accuracy and uniformity.





USED THE WORLD OVER

Canedy-Otto Radial Drill

Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line

Early delivery possible.

SPECIFICATIONS:

Drills to the center of circle on base or table Length of arm careatest distance from spindle to base Minimum distance from spindle to base Minimum distance from spindle to column Traverse of spindle Morse Taper Dlameter of spindle at nose Traverse of head on arm Traverse of head on arm Spindle speeds with 1200 RPM motor

Spindle speeds with 1800 RPM motor

Feeds per revolution of spindle

Bearing of arm on column Size of main driving motor Height of drill column over gears Working Surface of Base Not weight

8" Column 3' Arm	11" Column 4' Arm			Dolumn
731"	96"	1	20	
431"	48"		46	53
101"	15"		17	100
91"	94"		84	59
No. 4	No. 4		Vo.	
251"	361"	4	8	00
211" (60, 85, 13	24"		22	models
(425, 560,	860,	win i		IIII
(1200 RPM (85, 130, 1	80. 274.	on a	11.	models
(560, 860,	1160,			
(1750 RPM (.004" .007	**	on e	all	models
(.010" .020	16"		18	***
2 HP.	2 HP.	2	1	IP.
29"x45"	36"x60"	31	9"	88"
4000 lbs.	6200 lbs.	70	00	lbs.

CANEDY-OTTO MFG. CO. ILLINOIS

IMPROVED NO. 47 "ABRASAW"

A new 47 Streamlined "Abrasaw" is announced by The Bridgeport S a fe ty Emery Wheel Co., Bridgeport, Conn. The makers say it includes the good points of the No. 47-W with many improvements. The base is now a single casting. Coolant tank is in base and coolant pump is on rear of machine.

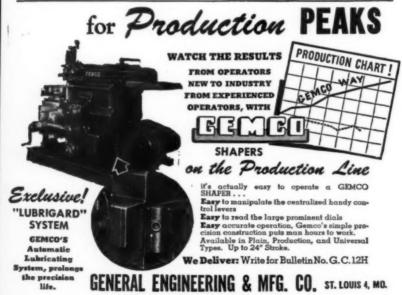
Automatic Coolant Control is regular equipment. Where speed of production is not essential, hand coolant control can be supplied.

Cutting head is practically the same as on the 47 W.

Vises can be furnished for straight cuts only or in the combination straight and angle type. Vise for straight cuts can now be arranged for foot treadle at small additional cost.

Capacity—Solids up to 1", tubing and light sections up to 2"; Motor—5 hp ball bearing, drip proof; Size of Discs—Up to 12" diameter, 1/16" to ½" thick, 1" arbor hole; Drive—4 V-belts, ½"x11/32"; Coolant Pump—¼ hp self-contained; Spindle—Ball bearing equipped; Floor Space—28x50"; Height of Machine—72".







Four Flute Double End Mill



Two Flute Double End Mill

OF MILL	DIA. OF SHANK	LENGTH OF FLUTES	OVER- ALL LENGTH	PRICE
1/8	3/8	3/8	3	2.20
3/16	3/8	1/2	3	2.20
1/4	3/8	5/8	33/8	2.20
5/16	3/8	3/4	33/8	2.20
3/8	3/8	3/4	31/4	2.20
7/16	1/2	1	41/4	2.80
1/2	1/2	1	41/4	2.80
5/8	5/8	13/8	5	3.44
3/4	3/4	15/8	55/8	4.20

PROMPT DELIVERIES

Send For Our 1943 Catalogue

EASTERN TOOL SUPPLY CO.

176 GRAND ST.

NEW YORK 13, N. Y.

How the PULLMORE CLUTCH "inches" the Work or Cutter Along

Where the shaper, lathe or miller operator wants to "inch" the work or cutter along, the PULLMORE clutch provides selective, idling and reverse speeds. The lathe head application at the right shows how compactly the PULLMORE clutch fits into the machine tool design.

Send for These Power Transmission Bulletins

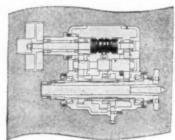
Contain useful application designs. Give capacities, dimensions and specifications. Show exclusive PULLMORE features that help engineer stand-out equipment.





Rockford Drilling Machine Division

Borg-Warner Corporation
1309 Eighteenth Ave., Rockford, III.



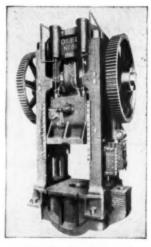


MECHANICAL TRIMMING PRESS

What is described as one of the largest mechanical trimming presses ever built was recently shipped from the Toledo Division of E. W. Bliss Co., 53rd St., and 2nd Ave., Brooklyn (32), N. Y. The press is capable of trimming the average run of forgings, as they come from a hammer, of approximately 33,000 pounds capacity. Operating at five strokes per minute, the machine is triple geared with twin drive on the crankshaft.

A four-piece tie-rod frame construction was employed. The Bliss multiple disc flywheel type air friction clutch and brake with electric push button control is another feature of this giant weighing 450,000 pounds. Specifications are.—Stroke of slide-24", counterbalanced by air; shut-height-distance top of bed to slide; stroke down adjustment up—42"; slide area F to B X R to L, 87"x60"; Bed area F to B X R to L, 98"x72".

More Bonds and Sweat Mean Less Blood and Tears Back the Attack



Buy Another War Bond



A screw loose?



UNBRAKO

Reg. U. S. Pat. Office

Self-Locking Hollow-Set Screws with KNURLED Points

Knurling of Socket Screws originated with "Unbrako" years ago. Yes, but • • • don't get this wrong . . . it's the machine that has a screw loose, not the mechanic. He only looks that way because he has so many machines to watch over and keep in repair . . . and with screws working loose and causing slow-ups, faulty performance, accidents, etc., it's enough to drive any mechanic crazy. So unnecessary, too. If machines had been equipped with Knurled "Unbrakos," you'd see a different picture altogether.

"UNBRAKO" HOLLOW-SET SCREWS WITH KNURLED POINTS are self-locking, vibration-defying — they stay put once they've been tightened into place and eliminate unnecessary loss of valuable time and labor, reduce maintenance costs and worries, minimize safety hazards.

Remember to specify Knurled "Unbrakos." Sizes: No. 4 to $1^{1/2}$ " diameter. Send for the "Unbrako" Catalog today.

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINFOWN, PENNA, BOX 60 & BRANCHES, BOSTON | DETROIT - INDIANAPOLIS - CHICAGO - ST. LOUIS - SAN FRANCISCO

SPECIAL While they last!



VERNON UNIVERSAL GRINDER VISE—Jaws: 4" wide x 1¼" deep, open to 2½" (with steel jaws inserted). Vise swivels 360° in horizontal plane, graduated 0°-90°-0°. Titls 90° vertically. Base swivels 360°, graduated 0°-90°-0°. Overall height 7". Hundreds sold for \$65.00—NOW, WHILE THEY LAST, only \$48.75, including crank and held-follows boths.

VERNOM 6" UNIVERSAL INDEX CENTERS—Compact, sturdy, for all types of indexing within their capacity. Divide all numbers to 50 and ell even numbers to 100, except 96 T. Nead swivels from horizontal to 10" pest vertical, accurately graduated. Warm adjustable for wear, ratio: 40-1. Spindle has take-up for end thrust, is threaded 1¾" diameter, 8 threads U.S.S., R.H. Formerly sold for \$125.00. NOW ONLY \$98.75, including three index plates, chart, table slot tangues and hald-down both! Send your orders TODAY!

MACHINERY MANUFACTURING COMPANY

Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and UPINDERS

LIMA POLISHING LATHE

Lima Electric Motor Co., 201 Findlay Road, Lima, Ohio, announces a Magnetic Polishing Lathe, especially suitable for highly finished parts. Leaving no chuck or collet marks, it holds parts from 1½" diameter up.

The unit is furnished with either single or two speed motor: 2 or 3 phase, with motor speeds to 3600 rpm. A self contained rectifier unit supplies d-c to the chuck. Interchangeable face plates and register plugs make it adaptable to various types and sizes of work. Can be supplied in either Pedestal or Bench type.

A pedal, which can be located in any position convenient to the operator, controls operation of the lathe. It magnetizes the chuck, starts and stops motor and demagnetizes chuck, leaving operator free to use both hands. A magnetic disc-type brake for rapid stopping of motor and chuck is supplied as standard equipment unless otherwise specified.

A swinging table attached to pedestal, which can be raised or lowered to accommodate different diameter chucks, holds parts or pieces to be processed.

All units are equipped with dependable Lima Drip-proof motors. Features



include:—Ball bearing spindle; dust tight heavy duty bearings; easy accessibility of entire unit; Compactness for convenience of location and flexibility of operations.

The lathe is said to have recorded production increases up to 300%.

AMERICAN MODEL CS-1

MULTIPLE CARRIAGE STOP

SETS 6 STOPS FOR DUPLICATE OPERATIONS

MODEL CS-1 FITS ATLAS, LOGAN, SOUTH BEND AND SIMILAR LATHES.

COMPLETE \$1875



- ACCURATELY GAUGES LENGTH OF CUTS
- PREVENTS ERRORS AND REJECTIONS
- ANY ONE OF 6 STOPS AVAILABLE
- STOPS ARE NUMBERED AND INDEXED

MULTIPLE CROSS SLIDE STOP

SETS & DIAMETER STOPS FOR REPEAT OPERATION



AMERICAN MODEL DS-8

- PREVENTS SPOILED WORK
- INCREASES PRODUCTION
- MAKES IT UNNECESSARY TO WORK BY DIAL GRADUATIONS

All necessary parts are supplied with each Multiple Cross Slide Stop.

IMMEDIATE SHIPMENT FROM STOCK. RUSH ORDER AND PRIORITY TODAY.

MODEL DS-1 FITS ATLAS, LOGAN, SOUTH BEND, AND SIMILAR LATHES. COMPLETE

\$1985

SCHULTZ & ANDERSON CO.

109 EDISON PLACE, NEWARK, N. J.

REGRIND OLD TAPS

with Minn-Kota **Tap Grinding Tool** Takes Taper or Plug Taps
1/4" to 15/8" diam.

Minn-Kota Tap Grinding Tool will work on either Lathes or Tool Grinders, also Bench Grinders by using special Stand. Grinds either right or left hand Taps. One large Tap saved pays for this inexpensive Tool. Send for Circular.

MINN-KOTA MFG. CO.

Dept. 904, Fargo, N. D.

MASTER SET PLUG GAGE



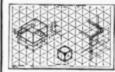
insuring that all plugs are replaced after use.

Plugs are set in increments of 1/64ths, starting at $\frac{1}{4}$ " and going to 1". There are three plugs of each nominal size—.0005" over, standard, and .0005" under.

All plugs are deep-frozen before finish grinding to relieve internal strain and provide accelerated aging, and are held to gage makers' (X) tolerance, lap finish.

Descriptive literature is available giving complete specifications and prices.

ISOMETRIC SKETCHES ARE



EASY TO MAKE AND READ!

One trial will make you another steady user of WADE'S ISOM-ETRIC blue lined paper. Shows all surfaces and in-

terior to scale. Makes clear blueprints. Saves time daily in hundreds of plants. Write for Circular. Wade Instrument Co. Dept. H. Cleveland, Ohio

hole inspection. The set includes 147 plugs and 4 handles in a unique plastic case. The case has a

transparent plastic cover which presents a clear view of the contents, and incidentally, indicates a missing plug, thus

Sav-Way Industries, Box 117, Harper

Station, Detroit, 13, Mich., offers a new Master Set of standard plug gages for



CLOSED MARK

Offset Type

ONTINUOUS

furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

Plain Type

AUTO MOULDING & MFG. CO.

2326 S. CANAL ST CHICAGO

SPECIFICATIONS: Open Width 1/4° to 6° Gage Material .040 to .125 Pin Diameter .101 to % Lengths to 120°

THREE-FOURTHS OFFSET

MACHINE TOOL BLUE BOOK

October, 1943

AMES

No. 13 COMPARATOR

For accurately measuring large, small and odd shaped parts speedily, this No. 13 Comparator is popular and attractive. The 8" square base is ground flat on top and often fitted with V blocks, anvils and stops of various kinds. The bracket which holds the 21/4" indicator extends 4" over the base and is adjustable for measuring up to 6".

Model \$30.00 Model \$30.00 Model \$45.00 There are many uses for this inexpensive, durable, high-grade Comparator in every shop where accuracy is essential.

SEND FOR



B. C. AMES CO.

WALTHAM, MASS., U. S. A.

EISLER AIR COOLED DISTRIBUTION TRANSFORMERS

Eisler Engineering Co., 762 So. 13th St., Newark, N.J. point out that by using air cooled transformers, many advantages heretofore unobtainable with transformers using liquids for an insulating and cooling medium are available. The use of air cooled power distribution transformers, presents a condition whereby the requirements of safety can be met effectively, and most always with material simplification in the installation and with reduced initial and operating costs.

Since no liquids of any kind are used, fire and explosion hazards are removed. It is emphasized that the Eisler Air Cooled Transformers may be located anywhere indoors without the bother and expense of building a protective vault. Inspection and maintenance are reduced to a negligible minimum due to the complete absence of such devices as valves, cooling tubes, liquid level gauges, gaskets and most important of all, the liquid itself.

Ability to place the air cooled transformer near its load center introduces additional economy by reducing the



heavy copper secondary runs, thereby improving voltage regulation and increasing operating efficiency.

Generally speaking, air cooled transformers are lighter and more compact than liquid filled counterparts, which facilitates handling and requires less floor space. Since no headroom is required, installation can be made where ceiling is low or on platform above working area.

The entire Eisler line is constructed throughout with class B, heatproof insulation—fibre glass, mica, asbestos and porcelain.

Transformers can be furnished up to 500 KVA in voltages to 4800 volts, single phase, 3 phase and Scott connected, 3 to 2 or 2 to 3 phase in one unit. Transformer illustrated is 333 KVA, single phase, 2400/4169V to 240/480 volts.



Accurase grinding of countersinks, either spiral or straight fluted, integral pilot countersinks, center drills and pilot drills, either right or left hand, "\u00e4" to 1" diameter. Firs any standard grinder. Perfect work with unskilled help.

Send for General Specification Sheet!

ACCURATE
MACHINE PRODUCTS CO.

DOUBLE YOUR DRILL PRESS CAPACITY

Minutes are Seconds with the new TWISTITE Vise.

Opens to full capacity in one second.

Speed Defense Production with this New Vise.



J. A. Richards Co., Kalamazoo, Mich.

Here's Another Saving on Short-Run Turning !

Sundstrand Automatic Lathe With 3-Tool Slides . . . Suts Turning Time

Gear blanks like these are difficult to machine in one setting because of the number of cuts required. If only two tool slides are used, the tool bits themselves are limited in size and strength. Consequently, the cuts are too heavy, cause chatter, spoil the finish, lower production and tool life.

In this installation the Sundstrand Model 10 Automatic Lathe is provided with three standard tool slides. This makes it possible to distribute the cuts evenly, use heavier tool bits and utilize maximum cutting feeds and speeds. As a result, the cutting time on lots of 140 pieces

Below: 3 tool-heads cut simultaneously.



has been reduced 40% from the former method.

250 Other Jobs Turned on Same Sundstrand Lathe

In addition to handling all of the more difficult jobs as described, the Sundstrand is also utilized for turning more simple gear blanks. Lot sizes in this plant range from 50 to 400 pieces.

Quick Cycle Change For Faster Set-ups

Quicker set-up and easy changeover are possible because of the Sundstrand simple cycle control. This control provides complete control of all cycles by simple adjustment of dogs on a disk.

Left and Below: Quick set-up for short runs is accomplished by adjusting dogs on a graduated disk.

Below: Some of the 250 different jobs turned. Tool 5 Faces
Groove C
Tool 6 Faces F
Tool 8 Forms
Radius G
Tool 10 Forms
Chamfer I

Tool 4 Faces D
Tool 3 Faces A
Tool 7 Forms
Radius H
Tool 9 Forms
Chamfer J

3-FRONT
Tool No. 1
Turns O.D.B.
Tool No. 2
Turns O.D.E.

How to Turn Short-Run Work Faster

is illustrated in this booklet describing features of Sundstrand Automatic Lathes. Ouick setup and easy

change-over features are described in detail. Write for yours today. Ask for Bulletin No. 417.





Rigidmils * Fluid:Scraw Rigidmils * Automotic Lathes * Mydraulic Equipment * Orilling and Contering Machines * Special Milling and Turning Machines

LYON HYDRAULIC TRUCK



The Die Handling and Stacking truck shown designed to these specifications: Cantilever Type; capacity, 1,000 lbs.; unit furnished with removable die handling boom and removable platform. Boom can be attached either to the carriage or the uprights. Platform is 25 in. wide by 30 in. long; lowered height is 8 in.; elevated height is 62 in.; elevation, 54 in.; overall height, 94 in.; fifth wheel steer. All wheels are 8 in. diameter with roller bearings, with brake for holding truck in position, i. e., floor lock. A speed hydraulic hand pump is supplied. Weight is 1075 lbs.

The truck has many applications such

1. Lifting and stacking, also lifting skid load of dies. In this case the platform alone is used.

2. With the platform removed and boom attached to carriage frame, the truck can be used as a crane to pick dies up from the floor and place them on

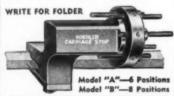
skids

It takes but a few seconds to change this truck from a platform to a boom truck, to a die separating device and back to a platform truck again. This particular truck, of course, can be designed to other specifications and capacities than those listed. It is made by Lyon-Raymond Corp., 216 Madison St., Greene, N. Y.

KOEHLER CARRIAGE STOPS

These carriage stops are used in conjunction with multiple setups and for single cutting operations.

They are deemed more efficient than the single They are deemen more efficient than the single micrometer type, and are an absolute necessity for production work on all types of lathes as well as turret lathes. Will maintain tolerances of 0.005° with case. This stop is clamped on the V of the lathe bed, and controls the length of depth of each cutting or boring operation.



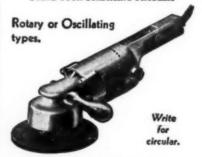
Distributors

Master Machine Co.

433 Main St. Stamford. Conn.

NEDCO SANDING-RUBBING MACHINES

SOLVE YOUR SURFACING PROBLEM



THE NEDCO COMPANY WALTHAM MASS.



Increases

SPEED

PRODUCTION

ACCURACY

CAPACITY

SAFETY

Saves

TIME

LABOR

MACHINES

TOOL STEEL

MAINTENANCE

CUTS SOLIDS — TUBES — ODD SHAPES — OR GANGS — Faster and More Accurately.

The modern method for handling 95 per cent of all cut-off work. FASTER, as cutting action is continuous. MORE ACCURATE, as it makes a wafer-thin cut to close tolerances.

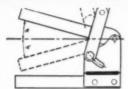
Small investment — low upkeep and depreciation — and easy setup.

Coolant attachment for production cutting or for hard metals. Saves Saws and triples speed.

Two sizes — Four speeds. Portable — plugs in anywhere.

MACHINE TOOL DIVISION

Kalamazoo Tank & Silo Co. Kalamazoo, Michigan



INFINITE POSITION WITH PEC EXTENDED BASE TOGGLE CLAMPS

No other clamp is as flexible in its application -in closed position, the clamping bar has infinite adjustment up to 15° below and above horizontal. Drop forged construction. Write for new 28-page catalog (on your firm letterhead, please).

roducts Engineering Co.





Three grades of diamonds. Common quality \$12 per karat. Medium quality \$24 per karat. Select quality \$43 per karat. Contour template diamonds supplied only in Medium and Select quality.)

1 All diamond sizes \$\frac{1}{2}\$ to \$10 karat are nib mounted for immediate shipment ... Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6' diameter of grinding wheel. (24 hour resetting arevier. \$1.00 near and the subject to approve the subject to ap ing wheel. (24 hour resetting service, \$1.00 post paid.)

The Most Complete and Up-to-the-Minute Line of Diamond Tools for War Production. Catalog and Grinders Instruction Card Free.

DIAMOND TOOL COMPANY, Not Inc. 938 E. 41st Street CHICAGO, ILL

"MULTI-MILLERS"



A complete line of multiple thread milling cutters featuring the Higbee cut are now available from the Plan-O-Mill Corp., 1511 E. 8-Mile Road, Hazel Park, Mich. Called by the official name of "Multi-Millers", these cutters are claimed to permit the milling of a perfect thread in a single operation.

The Higbee cut, provided by the Multimillers, removes the imperfect thread or "feather edge" at the same time the thread is milled. As a result, man and machine hours are saved and a better, more accurate, and longer-lasting part is produced.

This line of cutters is available in National, Whitworth, Acme, V, and special forms, with straight or spiral flutes. They are offered ground or unground in a complete range of sizes for use on any type of thread milling machine. Prompt delivery is promised.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. - Inexpensive last for years.

Write for Circular NIELSEN TOOL & DIE COMPANY 1962 W. Eleven Mile Road,

Berkley, Mich.



CP PNEUMATIC WRENCHES

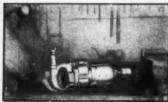
NEED BUT SIMPLE CARE TO GIVE LONG SERVICE

If you are fortunate enough to own a CP 365-R Pneumatic Wrench (Impact Type), take care of it!

CP Pneumatic Wrenches (Impact Type) have stamina built into them. Their sturdy construction and simplicity of design enable them to deliver exceptional service. Their slow motor speed, few parts, lack of springs and gears, and enclosed construction assure a minimum of maintenance.

But, like all tools, they need preventive attention to keep them operating at top efficiency.

HOW TO GET MAXIMUM SERVICE FROM YOUR \$ 365-R PNEUMATIC WRENCH



At start of shift place a few drops of oil in handle (valve open), then blow through.



2 If necessary to place in vise, clamp by handle, never by motor or clutch housing.



3 Once a week, remove the air screen plug. Examine for dirty or broken air screen.



A dirty air screen will rob your wrench of power. Keep thoroughly clean with air jet.

PNEUMATIC TOOLS
ELECTRIC TOOLS
[Hicycle...Universel]
ROCK DRILLS

CHICAGO PNEUMATIC

General Offices: 8 East 44th Street, New York 17, N. Y

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Up Goes Production Down Comes cost

A Husky but Sensitive Hopper Feed Screwdriver which drives small screws From No. 2 to No. 6 Screws.

Lengths 3/16 to 3/4 inches.

Standard or Special Heads.

Send Samples for Production Estimates.

Detroit Power Screwdriver Co. 2809 W. Fort St., Detroit, Mich.

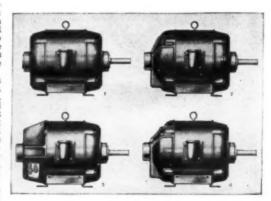


R. & M. "UNI-SHELL" MOTORS

After 30 months of development, Robbins & Myers, Inc., announces a new line of Uni-Shell Electric Motors—said to be the only complete line in which all motor types in any one frame size are interchangeable.

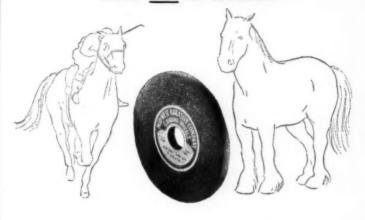
They are built within cylindrical shells of steel. In any one frame size, the shell dimensions, head fit, bolt circle holes, shaft size and conduit box mountings are identical for all motor types. This is true of polyphase induction motors, capacitor start induction motors, and generators, repulsion induction motors, as well as other types. Where one type can be mounted, so can any of the others.

Because one of two main reasons for motor deterioration is bearing wear, the firm reports going "all out" on bearing



standards, types and alignment. Standard on all ball bearing motors is the doublerow-width ball bearing which has an exceptionally large grease reservoir, and

GRINDING WHEELS AND HORSES have this in common



Grinding wheels, like horses, are selected with a view toward what they are expected to do. You wouldn't buy a race horse to pull a plow—or pit a plow horse against a Man o' War.

The most important factor in proper surface grinding is selecting the RIGHT type of wheel to do the particular type of grinding you expect it to do

MID-WEST "B" BOND grinding wheels, like all other MID-WEST wheel types, are engineered to perform specific grinding jobs—and they can be depended on to do those jobs quickly and efficiently. The "B" BOND wheel pictured here, for instance, is a MID-WEST silicon carbide vitrified 3.60 straight wheel, sized $7 \times \frac{1}{2} \times 1\frac{1}{4}$. It is built specifically to grind carbide tipped tools.

Aside from the proper shape of wheel, it is extremely important to select the proper grain and grade—and then use that wheel intelligently. Among other things, watch your wheel speed. Follow the manufacturer's recommendation. And watch your feed — don't "crowd" the job! You'll get more pieces per hour as well as more per wheel. Let our engineers prove it to you.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. Milwaukee Avenue

Detroit 11, Mich.





complete seals on both sides that are held in place by removable snap rings. The lubricant is sealed in and the dirt sealed out. Equally important improvements have been made on sleeve bearings.

Insulation incorporates the newer synthetic varnish treatments. Into smooth, clean slots, free from burrs or sharp edges, two layers of the high grade impregnated rag paper are placed, to minimize the danger of a weak spot causing a break-down to ground. The wire itself is coated with double-weight synthetic resin insulation for strength, toughness and flexibility. An added sheet of impregnated paper is placed between coils in the slot, and an improved method is used for holding end coils so that complete insulating paper protection can be provided between phase groups in the winding. The entire winding assembly is given successive cycles of pre-heating, dipping in special synthetic resin-base varnish, and baking. As a final protection, coils are thoroughly covered with moisture-resistant synthetic resin and tung oil sealer. High-voltage insulation tests-both before and after varnish treatment-assure trouble-free insulation.

Three grades of rotor balance are available on all types of Uni-Shell Motors:—static balance, commercial dynamic balance, and special dynamic balance. Precision balancing machines of the newest types are used, and vibrometers check the smooth running performance of each one.

A 20-page booklet illustrating and describing all features and improvements in detail, may be obtained by writing Robbins & Myers, Inc., Springfield, Ohio, Dept. 16M

COLLET HEAD LATHE UNIT

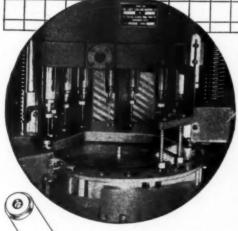
The Reynolds Machinery Co., Providence, R. I., manufacturers of Reynolds Coolant units for machine tools, announce a new Collet Head Lathe Unit—for polishing, finishing, filing and burring operations.

The new features include use of any standard motor instead of a special built-in motor; single lever control for starting, stopping, applying brake and opening and closing collet. Also, spindle may be stopped to inspect work without disturbing setting of piece in collet.

The machine uses a No. 5c Rivett Collet, a popular size used on South Bend 16" and 10" lathes and a size which many plants already have.

Spindle nose is threaded to provide for use of 4" chuck, which is supplied as an extra. The Unit has a 4-step V-belt drive.





PRODUCTION: 2000 parts per how, drilling two parts in each station, using No. 50 Drills.

MATERIAL: Brass.

PRODUCTION CHARTS GO UP WITH Avey DRILLING EQUIPMENT

Your installation of our Avey Automatic equipment assures you—increased speed in production. This Standard No. I Cam Feed Unit Machine, with Drill Head and Automatic Index fixture, is adaptable to many operations including Drilling, Reaming, Counter Boring and Tapping. Send us prints of your requirements.

THE AVEY DRILLING MACHINE CO. Cincinnati, Ohio, U. S. A.

DRILLING MACHINES

KOEHLER TAIL STOCK TURRETS

Five different tools are carried in the new Koehler tail stock turrets developed by Master Machine Company, 433 Main Street, Stamford, Conn.

The turret centers accurately by means of a taper pin and is locked in position by a lock nut. Five %" holes in the indexing head accommodate standard floating tap and die holders for box tools for drilling, tapping or threading operations. The tail stock turret is especially designed for clearance so that use of the device does not interfere with the proper action



of a turret head or other tool post turret in use. The tail stock turret is equipped with No. 2 Morse taper unless otherwise specified.

A new bulletin recently issued by this company illustrates and describes other Master equipment including the 6 and 8 tool turret heads and carriage stops for 6 or 8 positions.

F&H Lubricated High Speed Lathe-Genters Immediate Delivery * Troublefree

Outlast Other Lathe-Centers Many Times and the Cost Is So Little.



F & H MANUFACTURING COMPANY 10338 Gratiot Ave., Detroit 13, Michigan

KEEPING TOOLS SHARP

In previous Bulletins repeated references have been made to the importance of keeping metal cutting tools sharp at all times. The urgent need for production and the critical shortages of tool materials now serve to emphasize this more than ever before.

YOUR FIRST LINE OF DEFENSE against HIGH SHARPENING COSTS No. 57T Automatically Sharpens

Sharpens
Metal Saws
in gangs
up to 8⁸ in diameter.
Takes gangs up to 3½⁸
thick. The saws are
automatically indexed
and sharpened within
variation of plus or mi-

Write for Folder 57T.

nus .001 of exact dia-

THE WARDWELL MFG. CO. 3165 Fulton Rd. Cleveland 9, Ohio



collet chucks

All grip—no slip...no bearings, friction, heat or lost power...push out type...full spindle capacity or over...outomatic adjustment... work re-set without stopping lathe...2 sizes, 1" and 2" capacities...order now with proper priorities.

HALL MANUFACTURING COMPANY

622 Tularosa Dr. * Ph. NO 9679 * Los Angeles 26, Cal.



SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate ideal for small tool and die shops—saves time these five different ways:

- Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
- 2 Saves time and expense of drawing or tempering small metal parts in large furnaces.
- 3 Cuts handling time when normalizing or annealing small parts. No waiting.
- Conveniently available for pre-heating for subsequent high-speed hardening.
- 5 Eliminates shut downs and delays in servicing emergency repair orders.

AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
MH-3	8"W 6"H 14"L	29.6	3400	14.8	\$124.00*
MH-4	10"W 6"H 18"L		4800	20.9	\$191.00*

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—\$152.40.



REPLACEABLE HEATING ELEMENTS—Replaceable nickel chromium resistors embedded in rectangular refactory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

FREE Complete data covering specifications, addi-

tional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.



COOLEY ELECTRIC MANUFACTURING CORP.
36 SOUTH SHELBY STREET . INDIANAPOLIS 7, IND.



Attached in three minutes or less, the Globe Miller increases swing of your lathe 5 to 10 inches, depending on lathe size, permitting larger turning operations as shown above. With accessories, it performs practically all types of precision milling. Used extensively by U. S. Governent. Write today for full information.

GLOBE PRODUCTS MFG. CO.

More light means that you will not be scritistied with anything less than ABART close tolerances at any speeds, noiseless-

ABART Gears

ness, and long life.

Spur, Bevel, Worm, Helical, Internal. No Stocks. Send B/P for money-saving estimate.

ABART SPEED REDUCERS. Many types in stock. Ask for catalog.



Over-dulling of metal cutting tools will inevitably result in:

A reduction in productive capacity.

Poor finishes on the product.

Loss of accuracy with consequent rejections.

A disproportionate loss of tool materials, either thru tool breakage, or thru having to grind off too much material when re-sharpening.

Higher tool and labor costs per unit. Much waste of man hours and tool materials can be avoided by eliminating the causes of over-dulling, as well as of premature dulling, at their sources.

Over-dulling of tools can be reduced to a minimum by periodic close examination while in action, and by watching for the first signs of that condition. A program of re-sharpening after a given time or a given number of pieces, regardless of the apparent condition of the tools, is strongly advocated. It will prove to be economical in the long run.

Premature dulling has as its causes any one of a number of factors. These may be enumerated as follows:

Speeds too high for the hardness of the material to be cut, or inversely, materials too hard for the speeds determined upon.

Feeds either too heavy, thereby overloading the cutting edges, or too light, causing cutting edges to scrape rather than cut.

Work scaly on surface or having hard spots.

Poor supports for work or tool, causing springing and chatter.

Incorrect sharpening for the material to be cut.

Poor grinding finish on tool edges.

A sharp tool is an economical tool.

(National Twist Drill & Tool Co.'s Engineering Bulletin No. 192.)

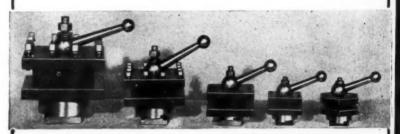


CUB

VARIABLE SPEED TRANSMISSION

Standard Transmission Equipment Co.

Built In Accuracy Enco Lathe Turrets



Increase Production

"ENCO" Turret Tool Posts

ENCO Turret Tool Posts are easily operated and easily maintained. Mount rigidly in T-slot of compound. Indexing is easy and positive and turret keeps setting accurately. Numerous users of our turret tool posts are holding limits of .001 plus or minus, without the use of micrometers. 12 position indexing enables the compound to be set at any angle. Carburized hardened steel construction. When ordering, specify make of lathe, swing and maximum tool size used.

Model S—Four tool 12 position 21/2" square Takes up to 3/4" tool......\$23.00

Model H—Six tool 12 position 3" hexagon Takes up to 3%" tool......\$25.00

Model 3½-S—Four tool 12 position 3½" square. Takes up to ½" tool........\$35.00

Model 4-S—Four tool 12 position 4" square Takes up to 5/4" or 3/4" tool................\$49.50

Model 6-S—Four tool 12 position 6" square Takes up to 1" or 11/4" tool or 13/6" tool holder for 3/6" bit.......\$99.00

"ENCO" Tailstock Turrets

The ENCO Tailstock Turret increases the normal tool capacity of your lathe six times. Its positive indexing mechanism— tapered and hardened—means accurate centering of all tools each time they are indexed for use. In the ENCO your tools are mounted in tool holes bored to close limits after assembly.

Model A-2½" dia. with No. 1 or No. Morse Taper arbor and six bored % tool holes

Model B—5" dia. with No. 2 or No. 3 Morse Taper Arbor and 6 bored 5%", 7%" or 1" holes; or with No. 4 Morse Taper arbor and 6 bored 1" tool holes......\$32.95

Model B-1—5" dia. with 1" straight shank and 6 bored 1" tool holes for use on Turnet Lathes \$37.95

ORDER FROM ENCO DEALER OR WRITE TO US FOR NAME OF NEAREST **ENCO DEALERS**

N C O MFG. COMPANY Dept. K

AND FACTORY:

GENERAL OFFICES 3321-23 Montrose Avenue Chicago 18, Illinois

EASTERN SALES OFFICE: 118 E. 28th ST., NEW YORK 16, N. Y.

DI-ACRO SHEAR NO. 2

A sturdier Shear of increased capacity and greater rigidity has been developed by O'Neil-Irwin Mfg. Co., 314 Eighth Ave., So., Minneapolis, 15, Minn.

This new No. 2 unit is said to incorporate the features, wide operating range, and also the accuracy of this Company's smaller units.

The new Shear weighs 75 lbs, maximum shearing width is 9"; maximum shearing capacity full width is 22 gauge steel plate.



CLEAN MOTORS LAST LONGER

BLOW out harmful dust, dirt, lint, etc. with the TORNADO Portable Electric Blower. Prolong motor life, Frevent hlowouts. Reduce replacements and fire hazards. Soon sayes cost, Investigate.

Write for details and FREE TRIAL Offer

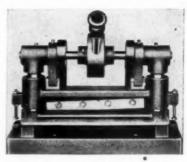


LARGE STOCK OF BRAND NEW

METRIC INVOLUTE GEAR CUTTERS

On hand for Immediate Delivery— Send for our Stock List.

LAFAYETTE TOOL & SUPPLY CO.



Accuracy is guaranteed to a tolerance of .001" in all duplicated work.

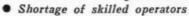
Both Shear Blades are of heavy tool steel, carefully hardened and tempered, accurately ground and aligned with a wide range of adjustments provided for wear and cutting control. Shear blades are reversible, offering double service without resharpening. Bearings are of cast iron to hardened steel and steels to bronze. The main bearings are provided with adjustments for wear and blade alignment.

An automatic spring charged action is said to provide faster operation and greater productive output.

As to application, the No. 2 Shear can be arranged quickly for shearing, splitting, squaring, stripping or notching to extremely close tolerances. All ductile and pliable metals and materials can be worked, including spring-tempered metals, fabrics, plastics, and the leathers, rubber, and the lightest of tissues. This versatility often eliminates the necessity for blanking or forming dies.



Here's your answer to today's three common TAPPING problems



- Need to use girls on tapping
- Can't get more tapping machines



Ettco-Emrick TAPPING ATTACHMENTS



ETTCO-EMRICK

TAP CHUCKS

Operator can see chuck jaws and tap head, assuring proper insertion of the tap every time. 5 sizes for No. 0 to 1"

taps. Details in Bulletin No. 6 Collet type chucks are available for No. 6 to 3/6" taps. Unskilled operators — men or women — can do fast, accurate tapping right on your drill presses with Ettco-Emrick Attachments.

The features which make this possible are:

- The exclusive Ettco-Emrick friction clutch which provides the delicate sensitivity needed in tapping, particularly with the smaller size taps. It's as sensitive as a hair trigger.
- 2. Reverse is automatic.
- Tap idles in the cutting direction, which prevents hole chamfering and preserves cutting edges.
- All parts are designed and built for highspeed operation.
- QUILL CLAMPS are available for mounting on any drill press with absolute rigidity, assuring accuracy.

GET FULL DETAILS IN BULLETIN NO. 2

Copy mailed on request.

ETTCO TOOL CO.

596 Johnson Ave., Brooklyn 6, N. Y.
Detroit Chicago

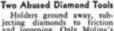


NICK DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

We make them Sturdier:

Today's war production conditions created a new problem: Over-use and frequent abuse by inexperienced help demanded greater ruggedness... Diamond Tools that stand up and take it.

Two generations of experience helped solve this problem. We invite you to put Molina Diamond Tools to the test.



jecting diamonds to friction and loosening. Only Molina's sturdier construction kept diamonds in holders.

Write for Literature

INDUSTRIAL DIAMOND TOOLS FOR EVERY USE



No. 520 - Multiple and precision finish. ing traverse.

Radius Diamond Tool for J. & L. Thread Grinder, Various other tools for radius dressing available.



NA INDUSTRIAL DIAMOND CO. OF U.S. - 31 W. 47TH ST., NEW YORK, N. Y

MIKRO-LOK BORING BARS

Universal Engineering Co., Frankenmuth, Mich., announces addition of "Mikrolok Boring Bars" to their line of precision tools.

Mikro-Lok Boring Bars. used for finishing cuts, are especially adapted to boring shoulders or the bottoms of holes. They are also efficient for making intermittent cuts. The blade protrudes beyond end of bar, thus permitting chips to fall ahead of bar. Within the bar is a unique micrometer adjusting dial by which blade can be set-and locked-to very close limits. The adjusting mechanism is entirely enclosed to prevent accumulation of foreign substances which might obstruct free operation or decrease accuracy.

Boring Bars are available with taper shanks for Swiss jig boring machines and Morse taper shanks, straight

shanks and a variety of flanges for Diamond Boring machines.

Several sets of blades may be arranged with tandem or independent mikro-lok adjustment. Universal Mikro-loks are now in production and are available for early delivery. A complete catalog describing Mikro-lok Boring Bars is avail-

KEYWAY CUTTERS

A complete toolcrib set of Keyway Cutters handily packed in a serviceable, well-constructed box is offered by Ash & Co., 3939 Grand River, Department D, Detroit.

The set includes all standard sizes of high-speed Keyway Cutters, giving im-mediate access to any Cutter from "201" to "G". This includes 41 sizes, from Old Standard No. 1, which is 1/4" in diameter and 1/16 inch thick, to American Standard No. 1212 or Old Standard No. G, which is 1½ inches in diameter and % inches thick.

Aside from the convenience of having Cutters available, this handy kit saves the chance of damage in the storing.

Special sizes of Cutters will be made to blueprint dimensions. This Company also offers end mills, combined drills and countersinks and other essential tool equipment, all of which are illustrated in an available catalog.





ATLANTIC★ Band Saw Blades

Speed Up

Metal Cutting Production

Atlantic Metal Cutting Band Saw Blades have been developed through twenty years of research and specialization.

> Send for Free Booklet

ATLANTIC SAW MFG. CO.

Metal Cutting Band Saws Exclusively

153 Brewery St., New Haven, Conn.



PRECISION THREAD ROLLING

Special Container

for parrow width

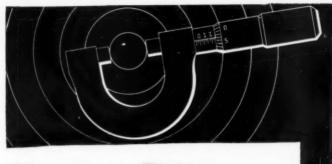
Convenient to use.

A new machine, which rolls outside threads by the cold forming process, is said to work on an entirely new principle. It uses two steel rolls of large diameter that have on their faces, negative multiple threads of the same profile, pitch and helix angle as thread to be rolled. These thread forming rolls are pressed with gradually increasing hydraulic pressure into workpiece or blank that has been machined to pitch diameter. All threads are rolled simultaneously. The blank, resting on a blade between rotating rolls, turns on its axis but does not move axially.

Automatic built-in sizing control, set by micrometer adjustment, releases hydraulic pressure on rolls when the required thread pitch diameter is reached, and then returns automatically, the carriagemounted roll to its starting position. Thus, all threads rolled are precisely of the same pitch diameter.

The new construction is said to result in a long rolling course, making it possible to adjust rolling pressure easily to peculiarities of different metals and alloys, to the pitch and to the diameter





REAMED RIGHT TO .0001"



Infinitely superior holes are finished in magnesium, bronze, aluminum, iron, steel, and alloys with Lempco-Evans Hi-Speed Steel Reamers. Right and left spiral blades shear in opposite directions simultaneously. .050" to .080" straight line expansion* (in both radial and chordal planes) maintains size and keen cutting edge. For special or difficult finishing jobs mail us your blue prints and full data.

Only LEMPCO-EVANS Offers You ALL These:

- · Adjustable for Size Instantaneously on the Job!
- . Makes Clean Holes (no abrasive grit)
- * Eliminates Costly Wear on Plug Gauges caused by Abrasive Left in the Holes
- * Extension Pilots for Alignment Jobs
- Locked-in Patented Blades Prevent Chatter
- Produces Mirror-Smooth Bearing Surface
- Opposite Spiral Blades Ream Smoothly over Keyways, Oil Grooves, Slots and Split Bushings

*(Sizes under 11/16" slightly less.)



5729 DUNHAM RD. . BEDFORD, OHIO

Geared For Victory

Gear Specialists

- SPUR
- WORM
- BEVEL
- . HELICAL

The Taylor Machine Co.



CLEVELAND 3, OHIO

"TAYLOR - MADE"

ALL MACHINE SHOPS NEED DIAMONDS



The Chisel Point Diamonds for Radius Dressing out-wear pin point diamonds 50 to 1. As illustrated above in 3/2 holder. Price \$6.00. Send for Booklet B.B. Territory open for distributors.

SOMERSET INDUSTRIAL DIAMOND CO.

of the thread to be rolled. The sustained rolling pressure is asserted to condense the metal forming the thread, producing a strong thread; at the same time, it burnishes thread surfaces to a mirror-like polish.

The machine is claimed to produce the accuracy (Class 4 Fit) required for threads on bolts, studs, screws, etc. made of high tensile strength steels as used on aircraft and other precision machinery. Accurate threads of all standards can be rolled also on light metals, hollow bodies, tubes, shafts or spindles, etc. Bearing block for roll on left can be displaced angularly, so that tapered threads can be rolled.

Capacity depends on metal to be threaded. The diameter is ½-1" for high tensile strength steels and up to 4½" for materials of lower strengths. Length of thread is up to 2¾". Production rate is very high in view of the high precision and quality of threads, and depends upon material and thread diameter.

The two thread forming rolls are mounted on heavy shafts running on roller bearings. Drive is by a 5 hp motor, V-belts and a double set of worm gears. Bearings and gears are oil-flooded. A separate motor drives pressure oil pump. All parts for drive, including coolant pump, tanks and filters are in machine base, fully enclosed.

Machine is built by the Watson-Flagg Machine Co., Inc., Paterson, N. J. and sold by W. A. Schuyler, 250 West 57th St., New York 19, N. Y.

SHOP EQUIPMENT

An especially attractive 548 page catalogue has been issued by Machinery Sales & Supply Co., P. O. Box 1078, Dallas, I, Tex. The pages are in 8x11° in size. An unusually complete line of production and portable machine tools and related shop equipment is presented. The products of many leading machine tool builders are represented, including such names a Armstrong Bros., Brown & Sharpe, Buffalo Forge, Carboloy, Covel Mfg. Co., Dreis & Krump, Ekstrom-Carlson, Fray Machine Tool Co., Greenfield Tap & Die Co., Greenlee Bros., Huther Bros., Machiner Tool Co., Marshalltown Mfg. Co., Monarch Machine Tool Co., Oliver Machiner Co., Onsrud Machine Works, Wm. Sellers & Co., Sheldon Machine Co., Skilsaw, Sundstrand Machine Tool Co., Thompson Grinder, Van Norman Machine Tool Co., and many others.

The book is well illustrated and it gives essential facts pertaining to a vast number of pieces of shop equipment.

Handles a Wide Range of Tapping Jobs!

Procunier Tapping Machines Are Truly UNIVERSAL

The machine here illustrated, for instance, by interchanging two tapping heads will handle from a No. 2 tap up to a 5/16'' tap in steel, %'' in cast iron and $\frac{1}{2}''$ in braces and aluminum. That means that in your shops one Procunier can do the work of two or more machines.

In addition, all adjustments can be made quickly and easily—such as regulating compensating spring pressure, setting depth stop, changing to any of the four speeds from 390 to 2050 RPM, or adjusting timing or flow of tap lubricant. Extra long compensating springs assure uniform tapping and reversing pressure independent of operator. Tap establishes its own lead for greater accuracy. Automatic tap lubricator provides abundant supply exactly when needed. Motor-driven continuous flow lubricant pumps also available. Has exclusive Procunier high-

speed tapping head with double-cone friction clutch and TRU-GRIP tap holder which has many advantages. Many other features.

PROMPT DELIVERY - SEND FOR BULLETIN

giving full details and prices on Procunier Universal Tapping Machines, High Speed Tapping Head and Tru-Grip Tap Holder.

PROCUNIER For Faster, More Accurate Tapping

PROCUNIER SAFETY CHUCK CO.

14 S. Clinton St., Chicago, Ill.

Send me bulletin on:

High Speed Tapping Heads

Tru-Grip Tap Holder

Name

Address

MAIL THIS COUPON TODAY



MANUFACTURING

& MACHINE CO.

C E Station, Bridgeport, Conn.

GEMCO BORING AND FACING MACHINE

General Engineering & Mfg. Co., 1523 So. 10th St., St. Louis, (4) Mo., announce a new machine for performing boring, turning, and facing operations on large work pieces, such as lathe beds, press frames, bed plates, pipe headers, valves and pieces too large to be machined on standard machine tools.

The machine is portable and can be taken to the work piece. Instantaneous change-over from boring to facing operations is provided.

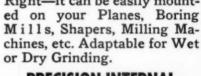
Machine proper is mounted on a heavy base on which it may travel by spindle action for 36". Automatic or crank operated horizontal travel of spindle housing is 19", and crank operated vertical travel is 24". There are seven spindle speeds ranging from 7 to 100 rpm, and four horizontal spindle housing feeds ranging from .009" to .063". Diameter of face plate is 33". Pump operated gravity oiling system is provided for all bearing surfaces and gears. Various optional features are available.













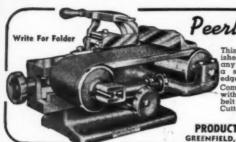
PRECISION INTERNAL-EXTERNAL GRINDERS

A 2 in 1 Tool—You can grind externally, and in a few minutes mount an inter-changeable Quill for internal grinding up to 24" deep.

Write for Catalog 43, illustrating a wide range of Grinding Equipment up to 30" wheels. Buffing and Polishing Machines up to 25 H. P., and Speed Lathes.

The STANDARD ELECTRICAL TOOL Co.

CINCINNATION ON IO



Peerless BENCH SURFACER

No. 606 - 6"

This Bench surfacer cleans and finishes castings, dies, stampings and any other work that is ground. Gives a straight line finish and leaves edges sharp.

Compact, durable, smooth running, with quick easy adjustments. Other belt surfacers and polishers, Tool and Cutter Grinders, Sensitive Drills.

Dept. P.

PRODUCTION MACHINE COMPANY

WELDER'S VEST POCKET GUIDE

The Hobart Brothers Co., have prepared a handy and valuable 24-page Vest Pocket Guide that is a "Must" on every welders List.

It's pictures clearly show and explain what is wrong with different types of faulty welds, and how to correct these faults. It suggests and illustrates all kinds of joints, fillet welds, and how to cut electrode waste. It explains the three Essentials of Proper Welding Procedure—completely explains and illustrates Welding Symbols—Trouble Check Chart on welding machine troubles. A how-to-find list and handy Reference information on decimal Equivalents are also included.

It will be sent free to all welders writing to The Hobart Brothers Co., Troy, Ohio, requesting Vest Pocket Guide for Welders EW-95.

SPEEDS DIE PRODUCTION



ONLY 90c Each

PROGRESSIVE & COMPOUND DIES

Modern Automatic Die Stops eliminate spellage. Cut mounting time to ½-hour. Need no installation skill. Hardened thruout. Try one. Or write for literature.

MODERN

Metal Specialty Ge. 4417 Montrose Ave. CHICAGO



The GLENNY Adjustable-Expansion BROACH

Produces low cost, accurate keyways. Eliminates set-up time. Self aligning. Interchangeable parts. Adapted for arbor press, mechanical or hydraulic pressure. Speeds up production. Cutter bars in carbon or high speed steel. Details Prite!

EAST SHORE MACHINE PRODUCTS CO.

833 E. 140th St., Cleveland, O.

OHIO





One of those things that save their cost over and over in time, manpower and getting work done quicker. Lift or carry . . . use for overhanging work . . . use as work bench. Capacity to 20 tons.

THE HAMILTON TOOL CO.

HAMILTON

HOW TO REPLACE CUTTING TOOLS

that can't be salvaged!

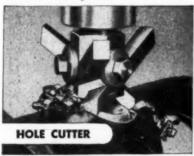






When worn or broken cutting tools can't be reclaimed for further service, replacement should be made with tools that conserve vital materials, time and labor. CLARK CUTTING TOOLS comply with these critical requirements, do better work quicker.

They use a minimum of tool steel (in cutting blades only) these can be resharpened repeatedly, replaced economically. Being adjustable, a few sizes do the work of many other tools, slash inventory. They make clean, *finished* cuts, reduce operations.





EXAMPLE NO. 1

Clark Adjustable 3-Blade Hole Cutters make accurate, smooth holes in flat or curved metal, plastics, wood, transite. 7 sizes cut 58" to 5", up to 1" thick. No reaming, deburring. Blades easily resharpened with low cost Clark Model C Grinding Fixture—assures longer life, correct angle.

EXAMPLE NO. 2

Clark Adjustable 2-Blade Fly Cutters. 2 sizes cut holes or discs 2½" to 10", up to 1" thick. Pitched blades cut true, relieve chatter. Other models cut gaskets, rings, discs from live rubber, problem materials.

WRITE FOR BULLETIN NO. MTBB-10

In Canada: DOMINION BEARINGS, LTD., TORONTO, MONTREAL, WINNIPEG Export: THE AMERICAN STEEL EXPORT COMPANY, INC., NEW YORK, LOS ANGELES

Robert H. Clark Company

3424 SUNSET BLVD. LOS ANCELES 26 . MANUFACTURERS: PRECISION TOOLS, PRECISION PARTS



DYKEM STEEL BLUE TOPS LOSSES making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY 2301G N. 11th St., St. Louis, Mo.

(In Canada: 444 Pacific Ave., Toronto, Ont.)

SELF-INDEXING BED TURRET

A new self-indexing bed-turret, with six tool stations and six individual stops indexing with the turret, is the latest development of Kessler Aero Tool Co., 211 West Palm Ave., Burbank, Cal.

Back-indexing by hand to speed production, when using less than a full set of six tools is one of the important features of this new lathe attachment as outlined by the manufacturer. And it is further pointed out that accurate precision repeating is insured because index bushings and lock pins are of hardened and ground tool steel.

Turret head is mounted on a pre-loaded Timken bearing which can be adjusted for wear. Ways are hand scraped. The attachment is lever operated for rapid action and has a maximum stroke of 4" with a minimum index stroke of 1½" and total travel, including the index, of 5½". Turret is shipped completely finished and assembled except for turret holes which are left to be bored on the individual machine for perfect fit.



Modernized . . . Beautified

BUFFALO'S MOST CONGENIAL HOTEL

* Today, you'll enjoy your stay at Hotel Lafayette more than ever! Extensively remodeled and redecorated, this fine hotel offers new convenience and comfort-but the friendly hospitality is the same as ever. Excellent food, home-like rooms, reasonable prices. And remember: Hotel Lafayette is Buffalo's most centrally located hotel. Moderate rates: Single, \$2.75 up; Double, \$4.50 up; special rates for 4 or more.

Write for Folder J.



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of

NEW ENGLAND



CARBIDE TOOLS

October, 1943

MACHINE TOOL BLUE BOOK

311

THREAD ROLL SNAP GAGE

The Sheffield Thread Roll Snap-Gage, a combined "Go" and "No Go" limit gage for rapidly checking male threads to both maximum and minimum limits in one operation has been added to the very complete line of gages made by Sheffield Corp., Dayton, Ohio. The gage comprises a frame similar to a plain snap gage in which two sets of gaging rolls are mounted, each roll being free to rotate. One set of rolls represents the "Go" limit, and

the other the "No Go" limit. These gages are widely used in aircraft, ordnance and automobile work as well as by many other industries for checking aircraft studs and various critical threaded parts. Sheffield has established a large department to meet the demand for them.

The makers point out that thread roll snap gages not only check assembly of male threads with female threads, but also assure uniform interchangeability within prescribed limits. In addition, they reveal specific inaccuracies so that steps can be taken to correct the tool or machine at fault.

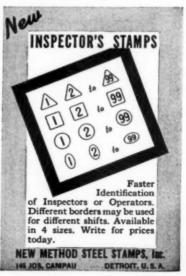
By exposing errors thru checking critical conditions in the thread itself, such as pitch diameter, thread angle and lead, thread roll snap gages go beyond the conventional gaging possible with ring gages.

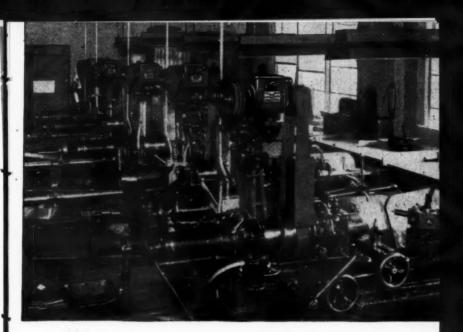
Among the advantages cited are faster inspection; economy due to long life because of little wear and reduction in the number of gages required. Rolls can be re-ground repeatedly.

Gages are furnished standard for American National form, coarse and fine series. Gages for all other forms are considered special and made to order.









as many as 350 in one plant

Hundreds of plants throughout the country motorize their machine tools with Western Transmissions . . . one Detroit plant has more than three hundred and fifty turret lathes so equipped.

The Western MASTER (1-5 h.p.) transmission including standard bracket f.o.b., Detroit, \$95.00.

The Western MAJOR (5-10 h.p.) transmission including standard bracket f.o.b., Detroit, \$145.00.

Western SUPER (up to 30 h.p.) with 8 SPEED CHANGES in Geometric Progression of 1.29 (total reduction of 6 to 1) . . . For Machine Tools, Rubber Mills, Steel Mills, Baking Machinery, etc.

Services of our engineering department are at your disposal . . . Send for new four-page catalog. Prompt deliveries on high priorities.

Battery of turret lathes motorized with Western Transmissions in the modern plant of Scully-Jones and Company, Chicago, U. S. A. . . . Photograph the courtesy of Scully-Jones and Co.

up to 30 h. p.

For Motorizing Lathes, Milling Machines, Shapers, Turret Lathes, Rac Drills, Slotters, Bolt Currers, Gear Curters, Die Sinkers, Baring Mills,

WESTERN TRANSMISSION

WESTERN MANUFACTURING CO. . 3400 SCOTTER DETROIT MICHIC



HE CHICAGO SCREW CO.

namely, a bility to pick up small whispers of electric signals and magnify them instantly into powerful commands to large machines.

Developed by Dr. E. F. W. Alexanderson and other G-E engineers just before war broke out in Europe, the amplidyne has stepped up literally thousands of military and industrial applications ranging from mining manufacturing, maneuvering, and firing the weapons of war.

A typical amplidyne assignment is controlling guns in aircraft turrets. Al-though one man could not, by himself, maneuver guns against the terrific wind resistance encountered by a plane flying 400 miles an hour, with the amplidyne he controls fire power as deadly in the air as a machine gun battery on land, and with the same ease as he would sight a rifle on a target range.

Already the amplidyne is in successful operation on fire control e quipment aboard ships, on antiaircraft guns, and

on searchlights both ashore and at sea. The device provides accurate, sturdy control and high speed of response over wider range than other equipment and, because of simple construction, is proving less vulnerable than other methods to bomb-impact and flying splinters from enemy shell fire.

CHICAGO, ILL.

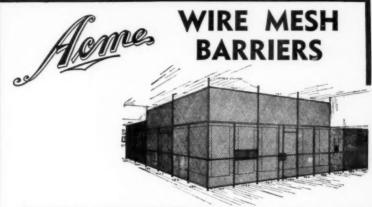
Simplicity of operation is also an important factor in installations aboard planes flying at high altitudes, where atmospheric conditions frequently impair the operation of other types of equipment.

"Back the Attack"-Buy Another Bond!

AIDS GUNFIRE CONTROL

The short circuit—often blamed for knocking out lights in homes and huge apparatus in power stations— is now increasing maneuverability of guns on planes and ships, and speeding output of armor plate and other products.

The short circuit and a coil arrangement known as compensating field winding are features of a General Electric development, the amplidyne, a simple rotating unit resembling motor or generator. It embodies magic similar to that found in the complex circuits of a radio set—



Illustrated below are two types of ACME wire mesh quards which are protecting many critical materials and machines in vital war plants. In order to enjoy adequate plant protection, windows and doorways of war factories must be quarded to protect against missiles and unauthorized entrance. Vent quard and full window quard below illustrate two of the types available. Send specifications for quotation.

Stop all sabotage and protect your factory and production with Acme Wire Mesh Barriers.

Acme Wire Mesh Panels are being used as barriers to guard tools, parts and critical material, etc., to prevent loss, theft and malicious tampering, sabotage, etc. They provide:

- Minimum interference with ventilation—including air conditioning:
- Protection with minimum obstruction to visual supervision:
- 3. Does not create a fire hazard:
- Minimum interference with necessary heat circulation:
- Maximum economy in use of critical materials:
- Facility of rearrangement to meet changing conditions without requiring new construction work and use of additional materials.

These Wire Mesh Barrier Panels are available for Essential Industrial Use.

SEND FOR CATALOGUE



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WIRE & IRON WORKS

CANFIELD & MORAN STREETS

DETROIT 7, MICHIGAN

THIS IS OUR FORTY-FOURTH YEAR

WIRE MESH

WINDOW

GUARDS



Center drilling long shafts on drill press at rate of 155 center-drilled holes per hour. Drill bushing is used as stop, maintaining uniform depth of center. Minimum drill breakoge, because center drill is properly guided and runs at correct speed. 1-inch Zogar Holding Fixture shown.

- 4

ZAGAR TOOL, INC. 23880 Lakeland Blvd. Cleveland, Ohio

X-RAY INSPECTION

tary work tables for

multi-station operation.

Get FAVORABLE PRICES

on SIX OR MORE FIX-

TURES for this purpose.

Get new Bulletin B-10

A new mass production X-ray machine capable of inspecting as many as 17,000 airplane castings in a 24-hour day has been developed for a Midwestern war plant, Westinghouse engineers have disclosed.

This brings the advantages of assembly line speed to X-ray work and makes it possible to X-ray metal castings for defects at a rate of one every five seconds.

Key to the new unit's speed is a moving conveyor 40 feet long and three feet wide that transports the castings through the X-ray inspection and provides the fastest method yet devised to spot flaws in large quantities of metal parts.

This unit produces an exposed film of six castings every 30 seconds to provide an almost continuous flow of exposed film ready for developing. When developed, each film shows an inside view of the six castings.

Faulty castings with blow holes, cracks and other defects then can be weeded out.

Designed to inspect both engine and fuselage castings up to five inches in thickness, the mechanism has been installed at a Detroit, Michigan, plant of a large automobile manufacturer producing war materials.

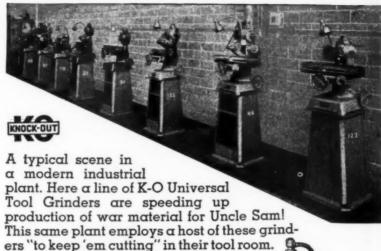
Inside two steel towers, each 12 feet high and situated near the middle of the conveyor, the actual X-ray inspection is conducted. Each tower houses an X-ray tube-one tube operating at 140,000 volts, the other at 220,000 volts -so that castings of different types and thicknesses can be examined at the same time.

The castings move along the conveyor

on trays that halt automatically under the X-ray tubes. A lead-lined protective device shields workmen from X-radiation while the exposure is made, and the castings then continue along the conveyor. For quickly identifying a ny defective casting, corresponding numbers are given the film and the castings.

The unit can be operated by one man or eight men, depending upon the volume and speed of production desired.

Owing to the safety factor provided by the lead-lined hoods, the unit can be located anywhere in the plant and other work can continue without interruption while the X-ray exposures are being made.



NOW!

The NEW
Knock-Out UNIVERSAL
TOOL GRINDER!
Deliveries Three Weeks.

A "MUST" for every modern manufacturing plant!

IN THE TOOL ROOM ON THE PRODUCTION LINE, this little giant will set new records and make its own way many times over.



Write for Bulletin No. UTG-43-10H-

THE K. O. LEE CO.

ABERDEEN

SOUTH DAKOTA

BOLTS TO DRIVE THE ENEMY NUTS



An airplane depends on this.

These fine precision-machined pieces are only a small part of Uncle Sam's swift-moving ships of the air—but a vital part. They are machined at Ace from rough forgings to highly accurate finished pieces.

RELY ON ACE FOR PRECISION CRIMDING Centerless, Internal Cylindrical, External Cylindrical, Blanchard Surface, Plain Surface, and Thread Grinding.

PRODUCTION MACHINING Turning, milling, drilling, cutting, tapping and threading of small machine parts that require precision grinding—on a mass-production basis.

SETAL STAMPING Blanking, forming, and extruding of small metal parts on presses up to 75-ton capacity. Spot welding, sub-assemblies and assembly of intricate radio and machine parts.

BEAT TREATING Electric and gas furnaces, individually pyrometer controlled, for high-heat, quenching, and carburising of parts up to approximately 10° x 10° x 15°.

1001 AND BIE WORK All operations for the production of Punches and Dies for small stampings, for Jigs, Fixtures, Gages, Moulds, Form Blocks, Tool Bits and Circular Form Cutters.

Send Blue Print, Sketch, or Sample to



ACE MANUFACTURING CORPORATION for Precision Parts



1251 E, ERIE AVENUE, PHILADELPHIA 24, PA.

UNIVERSAL HOOK CHECKER

A Universal Hook Checker, designed to enable rapid, accurate checking of hook or rake angles and flute spacing in sharpening thread milling cutters, is announced by Detroit Tap & Tool Co., 8432 Butler Ave., Detroit (11) Mich.



Visual aligning of a ground straight edge with face of cutter flute—against an illuminated background—permits operator to read the offset distance directly from an integral micrometer barrel. Simple placement of an indicator finger against cutting face enables any error of flute spacing to be read directly on an integral indicator dial. Use of this machine, it is said, eliminates the time-consuming, cumbersome positioning and adjusting by conventional methods of checking sharpening accuracy.

Machine has three principal components:—a base mounted on a pedestal, an adjustable cutter mount with a dual head—one for hook and one for space checking—and the hook and flute spacing measuring assembly. Lower cutter mounting center is fixed to base. Upper mounting centers are attached to a support, adjustable vertically to accommodate various lengths of shank type or shell type cutters with arbors.

Measuring assembly in which the ground straight edge finger and indicator are mounted, is provided with a vertical ad-



FOR BEST RESULTS FOLLOW THESE SUGGESTIONS

1 Sharpen tools and cutters frequently
The waste of critical alloy steel resulting from infrequent regrinding is enormous because so much of the
tool has to be ground away to renew the cutting edge.

Dress and true the grinding wheel
Dress frequently enough to retain correct wheel
shape and to keep the abrasive cutting particles clean
and exposed for most efficient grinding action. Excessive dressing, however, wastes the grinding wheel.

3 Use the best grain and grade of wheel for your job

ABRASIVE COMPANY "white" and "red" tool room grinding wheels have been standard for many years for all types of tool and cutter grinding. For exceptionally fast and cool grinding action on heat sensitive alloy steels specify the newer "No. 18 Density" wheels with open, wide-spaced porosity.



W80-L-P18 W80- J-818

W60- J-H18 W60- J-H18

30-O-D9

G120-H- VI

W46- J-STY W60- J-M19

ABRASIVE COMPANY

DIVISION OF SIMONDS SAW AND STEEL CO. TACONY & FRALEY STS., PHILADELPHIA 37, PA.

Distributors in all principal cities

justment controlled by a hand wheel. The two micrometer barrels controlling movement of the straight edge for right and left hand offsets respectively, are calibrated to measure offset distance from a radial line. Directly beneath straight edge is an illuminated diffusing glass background. Spacing indicator and its finger are positioned to measure any error of cutting face spacing by comparison with the spacing of a master index plate.

THE 25TH METAL CONGRESS

Cutting across the interests of all sections of the fast-moving war-time metal industry, the 25th annual National Metal Congress and War Conference Displays will concentrate the developments and progress of the past year into the week of October 18 through 22, in Chicago's

Palmer House.

Feature of the program will be a series of 17 sessions each afternoon and evening devoted to War Production, Conservation and Post-War Planning, to be presented by the American Society for Metals in the Palmer House. These practical sessions are in addition to the regular tech-nical program of 37 technical lectures to be presented by the Society during the mornings.

Technical programs will also be presented by the three national societies cooperating with the American Society for Metals in presenting this Metal Congress, with the Wire Ass'n meeting at the LaSalle, the American Welding Society at the Morrison, and the American Institute of Mining and Metallurgical En-gineers, Iron and Steel and Institute of Metals divisions, at the Sherman.

The War Conference Displays will house more than 175 manufacturers on the 7th, 8th and 9th floors of the Palmer House, where light equipment, such as x-ray machines, furnaces, welding and brazing units will be demonstrated.

The entire Metal Congress will combine to present a highly-geared metals laboratory where the research and developments of the past year may be placed at the disposal of industry to produce greater war production.

CARBIDE ROTARY CUTTERS

M. A. Ford Mfg. Co. Inc., 746 W. First St., Davenport, Iowa, prominent in the rotary file field for nearly 25 years, announce the latest addition to their line-Carbide Rotary Cutters.

It is expected that carbide is the answer to a long-existing need in the rotary

How else could you do this job economically?

To weld all seams and joints of this complex weldment down hand, the weldment had to be tilted, rotated, twisted, and turned — had to be held in a score of different positions. This score of different positions. This is easily done with a C.F. Positions, for at the push of a button it will votate a waldment ton it will rotate a weldment (thru 360°) or tilt it (thru 135°

beyond horizontal). Without a Positioner it would require almost constant attendance of a crane and its sling crew, with horses and plenty of floor clearance for handling. of floor clearance for nanding.
C.F. Welding Positioners come
in sizes and capacities up to
30.000 lbs. All are pedestal
mounted and are adjustable for height.

Write for Bulletin WP-22.

CULLEN-FRIESTEDT CO. 1321 S. Kilbourn Ave. CHICAGO 23, U.S.A.



Send for the Complete Story of WET-BELT SURFACING



The Proved Finishing Method that ...

- produces superior work, 5 to 25 times faster than previous methods. holds close limits, often .0005".
- works an entire area at once. eliminates dust or grit, injurious to
- other equipment and to health. eliminates heat, warping, distortion,
 - discoloring, fracturing, chipping.

- needs fewer, and only simple, inexpensive jigs.
- cuts set-up time and lock-up time often eliminates both entirely. permits inexperienced workers to get increased production and superior finish. replaces other machine tools on many operations, and supplements others to
- reduces cost of equipment, operation and maintenance.
 - improve results.



Porter-Cable's latest booklet "A New Precision Machining Method," gives you complete information on one of the most valuable machining helps for both hard and soft metals, stainless steel, plastics, compositions, ceramics, glass, that has come out in years. Because of the great demand for this booklet, it can be sent only to those who furnish us their title, company name and address. Tear out this advertisement, clip to your letterhead, and mail today.

PORTER-CABLE MACHINE CO.

300-10 Exchange Street SYRACUSE, NEW YORK

Hacksaw Blades



THESE FINE TEETH

START THE CUT ON THE FIRST STROKE AT ANY ANGLE

1-Starts cut at any angle.

2-Teeth will not catch on ridges.

3-No scraping to begin cut.

4-Less cutting time.

5-Will not slip off cutting line.

6—Wear distributed full length of blade.

Hand Tungsten

10x1/2x18, 24 or 32 Teeth — .50 Per Doz. 12x1/2x18, 24 or 32 Teeth — .60 Per Doz.

High Speed Molybdenum Hand

10 x ½ x 19, 24 or 32 Teeth — 2.25 Doz.
12 x ½ x 18, 24 or 32 Teeth — 2.50 Doz.

H. S. Power

12 x 1 x 10 T. or 14 T. — — .60 Each 14 x 1 x 10 T. or 14 T. — — .75 Each

IMMEDIATE DELIVERY

Please Send For Our Catalogue
On Complete Machine Shop Supplies.

SID TOOL CO.

177 Mulberry St.

N. Y. C.

file field for a cutter which will stand up longer against the hardest of metals. Actual reports from customers indicate that carbide rotary cutters will outlast ordinary high speed cutters by as high a ratio as 100 to 1, cutting faster, and of course with proportionately fewer regrinds.

At present the Ford carbide line consists of five different shapes in a total of 10 sizes—new sizes and shapes will be brought out as the need arises. Full details are given in the Ford Catalog.

B-C DRILL PRESSES

Over 60 models of the Helmet Head Drill Press are now being offered by Boice-Crane Co., 936 Central Ave., Toledo, Ohio. These are now available in one, two, three, or four spindle types; high and slow speed; bench or floor type; slotted or trough table.



Perfectly balanced and vibrationless, these drill presses are said to be sealed against all common hazards.

Five carefully pre-determined efficient speeds allow for every operation. A feature is the new self-centering 30-degree pressure angle six-tooth involute spline. The spindle, quill, and spindle-pulley are held in permanent, perfect alignment.

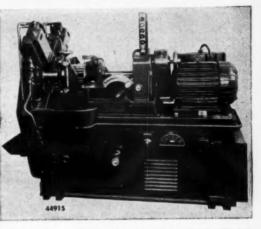
MULTI-SPINDLE HYDRAULIC BACK SPOTFACING MACHINE

New development to help speed production of aircraft engines with greater ac-curacy in machining is the Snyder multiple spindle hydraulic back spotfacing machine. It is designed especially to back spotface at one time, the entire set of bolt holes in the cylinder barrel flange of certain types of aircraft engines.

Cylinder head assembly is loaded in horizontal position and clamped manually on a sliding fixture. Cutting tools run in plain, nitrided steel bushings, mounted on hydraulically actuated tool slides, which move away from the work to facilitate loading,

After part is clamped in place, cutters are brought

into correct working position and multiple spindle driving head is manually advanced so drivers pass thru bolt holes and engage cutting tools for spotfacing.



Designed and made by Snyder Tool & Engineering Co., Detroit, a production rate is given as 26 pieces or more per hour.



A DOUBLE-SWIVEL



PLUS 3 EXCLUSIVE FEATURES

1—Instantaneous FREE-WHEELING without DIS-MANTLING the Head.
 2—Change from 40 to 1 ratio to Quick-Indexing,
 i. e. (Precision to Production) in 30 seconds.

-Life-time NO-BACK-LASH adjustment of worm and worm-gear.

REPUBLIC converts regular grinder or milling machine into Universal.

Now in use by Army, Navy, Boards of Education, Aircraft plants and other precision tool and machine shops. Needed in every Tool Room!

RITE NOW FOR DESCRIPTIVE FOLDER AND ATTRACTIVE PRICE AND DELIVERY



REPUBLIC TOOL MANUFACTURING CO. LOS ANGELES 1, CALIF. 7722 Maie Ave.

The quill, longer and larger in diameter, is held by three bearings, permitting long holes to be drilled more accurately.

Boice-Crane Tapping Machines, designed for the Boice-Crane Helmet Head, operate at 3000 rpm "N"; and 6000 rpm "OUT". Taps enter every hole centrally without strain. Two sizes are offered.

METAL GAUGE COMPARATOR CHART

Many different and divergent gauge systems have been developed in America for sheet metal, wire, etc. Correlating these has been a serious problem and there has been much confusion and misunderstanding.

As so many different metals carry different gauge numbers based on specified weights, of which the thickness is given in the gauge number, it has seemed impossible to contrive a number system of identification to cover the field. Deciding therefore, that a practical solution of the problem would be to specify all thicknesses in thousandths of an inch, R. R. Bostic, 1312 Ingram St., Los Angeles, 14, Cal., has devised a simplified chart which reduces all currently used gauges to thousandths of an inch.

This chart is now available in soil-proof, heavy, gloss paper 22½" long by 10" deep. It enables anyone to check any specified gauge in thousandths or fractions of an inch, as well as in millimeters. While it lists the 15 metal and wire gauges in the most frequent commercial use, it also reveals the relationship to any of the other gauge systems sometimes used.

At the bottom of this chart is a fractional and decimal equivalent list, as well as a list of all the commercial sheet metals and wires with the gauge systems by which they are currently ordered.

AIDS SMALL PART GRINDING

A late development for speedier and more accurate surfacing of discs, squares and other small parts is the "In-Out Feed" table, manufactured by the Porter-Cable Machine Co., 300-8 Exchange St., Syracuse, N. Y. It is an inexpensive but highly practical accessory, for use with their G-4 belt type grinder.

It comprises two tables, one at either side of the belt and both adjustable to the grit level, enabling the stock to be fed to and received from the belt on a perfectly flat plane, thus avoiding the



The New No. 47 * "ABRASAW" *

In many respects the NEW 47 "ABRASAW" is similar to the 47W, all outstanding characteristics having been retained. The NEW ABRASAW base is now of α single casting and contains α large coolant tank. The coolant pump being mounted on the rear is now regular equipment.

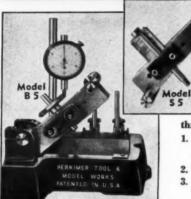
The cutting head is practically the same as the 47W.

Vises can be furnished for straight cuts only, or in the combination straight and angle type. The vise for straight cuts may be arranged for foot treadle operation at small additional cost.

Write for information and specifications.

The Bridgeport Safety Emery Wheel Co. 1304 BROAD ST.
BRIDGEPORT, U.S.A.

Simplified BEVEL GEAR GAUGING



No Difficult Operations, Involved Calculations or Intricate Manipulations,

With one set-up on these tools, any operator with ordinary gauging experience and a knowledge of blue print reading, can perform these

three important operations:

- Check dimensional accuracy of the addendum cone (gear face) as related to thrust face of hub.
- 2. Check accuracy of cone angle.
- Check run-out of gear face.
 Write for descriptive folder.

HERKIMER TOOL & MODEL WORKS, 1010 George St., Herkimer, N. Y.



danger of nicking or grinding out of parallel.

In addition, a rail holds the stock against pressure of the belt and also is adjustable. It can be set at the correct angle to control the amount of grinding. within micrometric tolerances. The device is positive, accurate and easy to use.

Attached to a wet belt grinder, it is dustless, protects against burned or abraded hands and can be used successfully by inexperienced operators, after a minimum of instruction.



It is often equipped with hopper and in-feed and out-feed chutes, for semiautomatic operation. Ordinarily, these are worked up in the user's own tool room. Porter-Cable engineers will gladly furnish data and suggestions.

WILDER PROJECTOR IMPROVED

A new model of the Wilder Projector, containing a 2" diameter condenser, has just been developed and placed upon the market. This new condenser replaces the previous 11/2" diameter condenser and provides a larger beam of parallel light, permitting the use of larger diameter lenses in the lower-power series. It is said that as a result of this improvement, the optical efficiency of the instrument has been greatly increased. The diameter of the new 10X lens is 1\%" and that of the new 20X lens 13/16".

The larger condenser has also resulted in a newly designed, fully enclosed head, with a streamlined and better ventilated lamp house. For maximum smoothness of operation, spiral gears are now used



DUSTKOP Dust Collector. That's

Only a few minutes are required to connect up DUST-KOP. The intake makes a slip fit with flexible metal hose so that there is NO DUCT WORK required. Equipped with G. E. motor (or equal) and multiple-blade fan, DUSTKOP is ideal for collecting dust from tool, surface, cutter and internal grinders. Dust laden



05 First National Bidg

Ann Arbor Mich



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PRECISION GAGE BLOCKS

SURPASSING BUREAU OF STANDARDS SPECIFICATIONS

FONDA GAGE SALES

205 E. 42nd ST.

NEW YORK IT, N. Y.

GIRLS CAN OPERATE

NEW Rouse HAND MILLER FOR SMALL PARTS



One of the ROUSE Fixture Set-Ups the

The Rouse Hand Miller is a versatile, efficient, high-speed ball bearing machine for handling light cuts in brass, aluminum and steel.

Rouse Fixture Set-Ups make the Rouse Hand Miller readily adaptable for accurately milling small parts for planes, radios, electric motors, and similar equipment. Spindle will take milling cutters or end mills.

Prompt delivery can be made. Send for circular.

H. B. ROUSE & COMPANY



TWA's maintenance department is organized to turn out precision work at high speed . . . its layout is arranged for high efficiency . . . its machinery and tools selected as best suited for the job. That's why TWA's use of Parker Vises is so significant. Working on airplane parts, a vise slip may mean a spoiled unit. TWA plays it safe . . . picks Parker Vises to protect against waste of materials and loss of valuable time. The Charles Parker Company, Meriden, Conn.

PARKER VISES AMERICA'S OLDEST in the focussing motion. The setting thus becomes self-locking to a certain extent. The lenses are also set in larger and heavier mounts, which facilitates changing and proper positioning in the lens cone.



Wilder Projectors are now available in the following magnifications:—10X-20X-31½X-50X-62½X-100X,

Full information may be obtained from the George Scherr Co., 122 Lafayette St., New York 13, N. Y.

HOUGHTON OFFERS "RUST VETO"

A new hard drying rust preventive providing a glossy dry, thin film, is announced by E. F. Houghton & Co., Philadelphia. This product, known as Rust Veto 110A, is a light, amber-colored liquid applied by brush or spray. It is said to dry in 25 to 30 minutes to a thin, glossy transparent film which is hard yet flexible at temperatures as low as minus 70° F.

Thickness of film approximates .0003". Flash point of the material is 110°F.

When dry, the coating is non-inflammable. It has excellent adhesion to metal, even after being subjected to soaking in water for 24 hours.

DRIVE WHEEL MOVEMENT VISE

Announced by the Berco Mfg. Co., 423 W. Superior St., Chicago is the new Hilco All-Angle "Driv-Wheel Movement" Vise with three highly accurate and legible protractor dials for horizontal, vertical and diagonal settings. It was designed and engineered by the industrial en-



SPEED punching and SAVE belting with MASTERDRIVE

How it speeds — High torque, high slip motors pick up the load with minimum shock. No slipping. Gear head motor reduces output shaft speed, permitting a large motor pulley and a high percentage of belt wrap.

How it seves — Use your present belting. Save rubber, and expense and delay of grooving pulleys. Belt failure will not capsize drive.

 Drive easily mounted above or behind press. No interaference with roll feed. Does not obstruct die removal through back of press. A single complete installation with Master Gear Head Motor — one responsibility. Write for details today!



MASTER ELECTRIC CO.
INDUSTRIAL EQUIPMENT DIVISION - DAYTON, ONLO

Anderson HAND SCRAPERS Three sizes, ¾". 1". 1¼"; with attachable blades 1/16" thick. Also made with carboloy tips in 1" and 1¼" sizes.

Blades, tested for proper hardness stand up under hard usage. One Anderson blade is equal to an ordinary hand scraper reforged about 5 times. When worn out a new blade makes a new scraper. Making scrapers from old files is too costly; hand made and forged scrapers cost three to five times more. No need to grind an Anderson Blade . . . stoning is all that is required. Blade cuts faster, lasts longer and saves grinding time. Blades purchased by the dozen cost only about one-tenth the cost of making one by hand.

Write for complete information.

ANDERSON BROS. MFG. CO.,

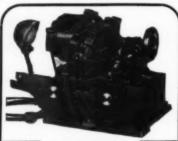
1917 Kishwaukee St., Rockford, III.





You will say, like hundreds of others, this is the best book for its purpose ever printed. Employees like it because it's clearly illustrated - easy to read. Tells how to use gage blocks, sine bar, vernier instruments. Chapters on history of measurement, care of gages, etc. Write on your letterhead. No charge of course.

JANSSON GAGE COMPANY 19220 Glendale Avenue . Detroit 23. Michigan



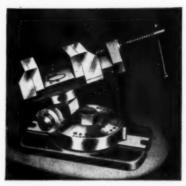
RECONDITION YOUR SAWS AT VERY LOW COSTS

Howe - Lindsey Automatic Saw Sharpener, the fastest and most compact machine for sharpening hack saws, band saws, or metal slitting saws. Automatic in action, requiring unskilled labor: will produce nearly perfect cutting tooth, provides for greater production and longer life of blades, saving steel.

HOWE AND SON, INC. HINSDALE

gineering firm of Melvin Douglas & Associates, Chicago.

Features include a patented drive wheel motion which gives 2\%" lateral clearance; double swivel construction which permits any conceivable horizontal position; right angle clearance which allows perpendicular position without base obstruction; positive horizontal setting for highest 180 degree accuracy; elimination of excess weight and improved construction for easy handling.



The Vise is recommended for grinders, drill presses, milling machines, magnetic chucks, many other machine tools, bench use and it is especially adapted for the Hilco universal Cutter-Grinder.

There are three sizes: 3½, 4½ and 6" jaw widths. Descriptive literature is

available.

FORMED WHEEL GROOVE GRINDER

A special Geargrind Machine has been designed for grinding ball grooves in the outer housings of the Rzeppa Constant

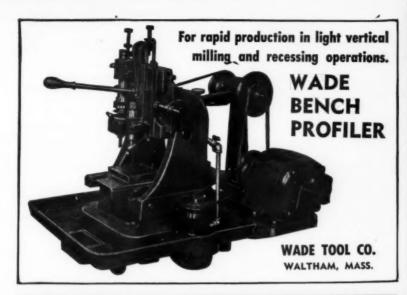
Velocity Universal Joints.

The work oscillates on a swinging head, controlled by an automatic magnetic brake, permitting the formed wheel to grind the radii for the ball groove in a curve. The formed grinding wheel is fed in from the front, the rapid traverse of the table being governed by means of an air cylinder. The spacing of the grooves is controlled by an accurate index head. Ball grooves in the various sizes of

Rzeppa joints range from 11/16" to 1-13/16" and this machine accommodates them all,

without change of spindles.

Geargrind engineers will be glad to discuss application of formed wheel grind-



Which Type of Vise Do You Need?



MODEL C-500 — For clamping parts of varying thickness. Eliminates danger of distortion because position of sliding jaw is governed by thickness of part being clamped.

MODEL SA-500 — For clamping parts of uniform thickness. Pressure is adjustable from 0 to 10,000 pounds, and remains constant for the length of the "run".



Both models speed up production milling and drilling operations tremendously. Pressure is applied by togale linkage, requiring a minimum of exertion. Wide jaw opening makes it easy to get the parts quickly in and out of vise. Write for cattles describing characteristics.

of vise. Write for catalog describing other outstanding features and advantages.



PRESTO-VISE

D. A. SMITH & CO. 8087 Livernois, Detroit 4, Mich.

g



ing to special problems, where accuracy and production are prime factors. The machines are manufactured by the Gear Grinding Machine Co., 3901 Christopher, Detroit, Mich.

HALL COLLET CHUCK

Features of simplicity and efficiency, absence of latches, fingers, cams, dogs or irregular parts are claimed for this device. It provides full capacity and increases output when mounted on thread ed spindles, the makers state. Model A fits all lathes with 1½".8 thread spindles, Model B fits 1¾" spindles. Larger sizes, available on order, says Hall Mfg. Co., Tularosa Drive, Los Angeles, manufacturer.

Only a slap of the hand is required to lock or unlock the chuck, without stopping lathe. A powerful grip is built up thru compound leverages, but it is easily locked or unlocked even by girl operators. It is designed to cut high alloy steels, using women operators.

High degree of precision is claimed on production work, as this is a "Push out" type chuck, pushing stock against the stop, so that length accuracy is easily

AMIC Comparator

A PRECISION INDICATING GAGE

Designed to replace special gages, flush pin gages, snap, height gages. For accurate, convenient and quick checking of components, either in the tool room or on the production line. Permits precise gaging throughout the whole day without eye fatigue. Each division of the scale represents 1/10,000th of an inch. Interpolations of .00005 easily achieved. Clear readings on 6" scale with inch and millimeter readings. Magnification is 1000. Measuring capacity is ±.003" and ±.05mm.

Note our improved list of accessories designed to suit your particular measuring problems. Thread measuring device, serrated anvil, vee-blocks, centering fixture, ball anvil and several types of backstops.



Our extensive experience will solve your measuring problems

AMERICAN MEASURING INSTRUMENTS CORP. 240 West 40th St. New York, N. Y.

Manufacturers of Gages, Jigs, Fixtures, Service Tools and Precision Units

Great for Honing, Grinding, Polishing!



Machine and tool shops that use the Eis Hone say they simply couldn't get along without this valuable time-saving tool. In the average shop there are many jobs where the removal of a few thousandths of an inch is a necessary process. This work is often done on expensive equipment, by slow, laborious methods. The Eis Hone does it in a jiffy, saving vital man-hours. Extensively used by plants engaged in War work,

Three-stone expansion type-any tension. Two sets of stones, coarse and fine, for grinding and polishing.

Flexible or solid drive. Can be used in a machine tool, slow turning electric drill or flexible shaft machine. Three sizes, for bores from 3/4" to 2".

Let us know your requirements and we will make recommendations.

Ask for open territory. EIS MFG. CO., INC., Middletown, Conn.

TOOL AND HARDWARE JOBBERS:



OLIVER DIE MAKING MACHINES

THE basic needs of faster, smoother sawing and filing are met with the Oliver Die Making Machines. Operating efficiency is increased 50 to 60 per cent over hand methods in the making of precision dies, gages, cams, templates and similar products requiring rapid and accurate filing, sawing and lapping operations.

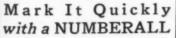
Send for literature describing the line of Oliver Die Making Machines!

OLIVER INSTRUMENT COMPANY

1488 Maumoe St., E.

Adrian, Mich.

We also build Drill Grinders, Tool and Cutter Grinders, Fuce Mill Grinders, Template Tool Bit Grinders.





Make Fast Work of Small Jobs

& TOOL CO. Huguenst Park, Staten Island 12, N.Y

Motor Driven

Timken roller or ball bearings to spindle



obtained. Chuck is rigid, extending only 2" beyond spindle, and design eliminates need for thrust bearings. All parts turn at spindle speed so there is no friction or heat. Bar stock varying substantially from standard size is tightly held by automatic adjustment of pressure on col-



Accurate mounting is obtained by an adapter that is cut running true on lathe spindle on which it is to run. Installation is quickly made on any lathe and only fulcrum of locking arm needs to be bolted to lathe.

JONES BENCH GRINDER



A Jones Bench Grinder and Polishing Machine No. 135 has been added to the wide line of abrasive belt grinding equipment manufactured by Jones Engineering Co., Ellwood City, Pa.

DESMOND GRINDING WHEEL DRESSERS and CUTTERS



We can supply you with the proper Dressers and Cutters for all of your grinding wheels.

Ask for copy of our catalog and name of your nearest dealer.

SIMPLEX Steel Slide VISES



A full line of Machinists' Filers, Welders, Production and Drill Press and Milling Machine Vises.

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DESIGNED FOR ALUMINUM AND STAINLESS STEEL

This NEW



Spot Welder

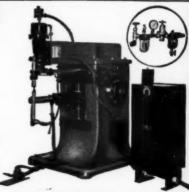
KT Model Press Type

Made in Voltages to meet Special Requirements where high Amperages and Controlled Pressure are required.

Timing Equipment for Special Jobs.

Air Operated, Oil Lubricated with Air Gauges for controlling pressure.

Water Cooled Electrodes — Refrigerating System may be added for High Production.



For additional information outlining exactly how this new welder will increase your production. Send us complete details regarding your welding problem. These Welders are individually designed to fit your needs.

300-322 Jackson St. THE TOPEKA FOUNDRY & IRON WORKS CO.,

Topeka, Kansas

It is a handy, fast-cutting unit designed or production work. Ruggedly construct-d, it fits on any shop bench. It is adaptble to any type of grinding and finishing rom flat pieces to irregularly shaped

Precision ball bearing construction is eatured thruout. Controls are located at ront, handy to operator, for belt alignnent. An adjustable spring tension deice on idler pulley maintains belt tenion. Grinder may be used with any 3/4 to

hp motor. Since motor is mounted nderneath bench, away from dust and lirt, an enclosed type motor is not neces-

It is equipped with a patented, cushiond, segment face contact wheel; uses harp, fast-cutting, factory-coated abraive belts; and has a Jones 3/M Rubber

Contact Roll.

FLEXOID SAFETY MATS

A new type of safety mat for foot comort in the shop has been developed by he Smith Power Transmission Co., 1545 . 23rd St., Cleveland, 14, Ohio. The mats re made of non-critical materials—oak, which means toughness for long service inder hard usage. The mats lie firmly on uneven floors and with a minimum risk of foot slippage, even when oily.



The manufacturers point out that the mats are easy to clean or wash, do not slip on the floor, are easily rolled up for carrying, and can be stacked in small

NEW Improved

-Vapor Degreasing Speeds Up Vapor Degreasing

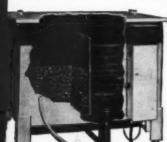
by More Than 33-1/3%

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Developed by Phillips, PHILLSOLV vapor degreasing solvent is tops for efficiency. It cuts vapor degreasing time by one third! Reduces vapor loss. Handles wider range of greases. Gives more thorough penetration of close, nested parts of ferrous and non-ferrous metals. Low toxicity-higher safety factor.

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PHILLSOLV, non-water soluble, has many applications in instrument and war plants. No corrosive action. Write today for FREE manual on Vapor Degreasing telling how to use this new process. Also for catalog of Phillips Electrical Vapor Degreasing



Complete Line of Electrical VAPOR DEGREASING MACHINES A machine for every type of job. Portable—can be moved to the job. Require no gas, water or steam lines. Many other features. Write for catalog.

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Equip Your Shop With NICHOLSON EXPANDING MANDRELS



Time Saving Economy Tools! TYPE A — STEP JAW DESIGN

Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

No.	Range of Bores Taken	Net Price	
IA	1/3" to 1"	\$12.00	
2A	1" to 11/2"	16.00	
3A	11/2" to 2"	23.00	
4A	2" to 3"	34.00	
SA	3" to 4"	40.00	



TYPE B—STRAIGHT JAW DESIGN Adapted for work with both short and long bores.

No.	Range of Bores Taken	Net Price
îx	1/2" to 9/16"	\$10.00
2x	9/16" to 21/32"	11.00
2x 3x	21/32" to 3/4"	12.00
00	3/4" to 7/8"	14.00
0	7/a" to 1"	16.00
1	1" to 11/4"	18.00
2	11/4" to 1-9/16"	21.00
3	1-9/16" to 2"	29.00
4	2" to 21/2"	40.00

(Other Sizes Taking Up to 7" Bores)

Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Write for bulletin.

W. H. NICHOLSON & CO.

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that will last longer than Other types of Heating Equipment

Cast Iron Series Grid Unit Heater become permanent equipment, once installed, and wi operate efficiently year after year—wither maintenance expense. Its lower outlet temper tures with greater air volume and more a changes per hour assure comfort in the worling zone at low fuel cost.

Engineered anterted to operate with eith steam or hot weeted to perate with either or to 250 ha, steam of high team or hot weeted to 250 ha, steam of high team o

D. J. MURRAY MFG. CO



ace. The slotted construction permits r circulation and drainage. Can be thorowaterproofed by dipping in a wood caler and preservative. The mats are

available in two stock sizes; 2x3' and 4x3', but special sizes are built to order. A new bulletin is available giving complete information.

LE MAIRE HYDRAULIC 3-WAY BORING MACHINE



A special hydraulic 3-way boring ma-hine has just been developed by LeMaire Cool & Mfg. Co., Dearborn, Mich. It was lesigned to bore and counterbore 12 holes n a cast steel differential and final drive ousing.

This huge part, having a total length of even feet, weighs approximately 1200 lbs. t is loaded and bored and back on the loor, completing the cycle within 30 minites. This is said to be about one-tenth he time formerly required to perform hese operations on standard boring mills.

The machine consists of a center head and two end heads. The center head has one spindle carrying a 10½" cutter on either side. Each of the end heads has two spindles, one having three cutters and the other two.

The machine is designed to bore and counterbore five holes in each end, ranging in size from 5.118 to 7.125" in diameter while the center head bores two main bearings 10.501" in diameter and also sweeps the shoulder bearing seat. All holes are held within .0012" tolerance.

The Bendix Vernier Caliper

(A Lafayette Tool)

TOTAL LENGTH: 8 INCHES

MEASURING CAPACITY 5% In.

Measurements: Outside, Inside,

SCALES: 1/16 with Vernier: 1/128 in. .025 in. with Vernier: 1/1000 in.

Net Price \$10.75

HARDENED MODEL Net Price \$16.00

Depth, and Depth of Threads. SEND FOR OUR CATALOGUE.

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UNIVERSAL JIG VISE

Build your fixtures around this completely predesigned drill jig body. A real time and money saver. Helps you get into production quicker at lower cost, Savings in time up to 60% not un-

FAST AND EASY TO OPERATE

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Lever locks instantly - holds securely. Throw it back and work is released. No complicated adjustments. Saves cost of expensive drill fixtures - only a bushing plate and adaptor needed for each job, Hundreds of Universal Vises now in use saving vital time and money on important war jobs.

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Manufactured by MOHR LINO-SAW CO. 130 N. Union Avenue Chicago, III.

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PADDOCK Ball Bearing BAND SAW GUIDES

Recommended for New and Old Machines cutting all material at any speed.

SENT ON 10 DAYS' TRIAL

The use of Paddock Ball Bearing Guides increases the efficiency of the machines so that more and better work can be done. The hazard of operation is reduced. Most of the blade breakage is eliminated. Wheels are interchanged—in effect, three sets of guides in one.

Write for details today and list of prominent manufacturors using Paddock Guides.

PADDOCK TOOL COMPANY

Guide Makers Since 1920

18 Walnut St ..

Kansas City, Mo.



Both end heads feed while the center head bores one large bearing. When one large bearing is bored, the center head reverses and rapidly advances to a feeding position to bore the large bearing on the opposite side.

WADE LATHE CABINET



The Wade Tool Co., Waltham, Mass. has recently developed a new steel cabinet mounting for the No. 8A Toolmakers Precision Lathe. This is a precision, screw cutting, backgeared lathe with 1" collet capacity.

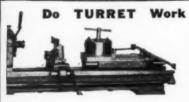
The motor and motor drive are contained in the cabinet and 12 speeds are provided, arranged in geometric progression from 35 to 2000 rpm—other speeds higher or lower are optional.

Space in drawers and cupboard at the right side is arranged for collets and other attachments.

G-B-M COLLET CHUCK

For second operation lathe work, a type of step-collet known as the G-B-M Universal Collet Chuck is finding quick acceptance. It operates with the usual drawin collet attachments on a lathe, having a threaded shank to be engaged by the draw-bar and with a tapered shoulder to fit the closing sleeve in the lathe spindle.

The shank and tapered shoulder are hardened, but the 3" diameter head is normal cold rolled steel. With the Collet Chuck held in the lathe, a recess is bored in the head, the size of the work to be held. The bored arcs of the three head



ON BENCH LATHES! LYNN HEAVY DUTY Self-Indexing BED TURRET

With this sturdy, rigid conversion unit, unskilled help handles accurate screwmachine work — FAST! Quickly pays for itself.

6" head, hardened inserts, 51/2" turret travel; fits standard bench lathes up to 14" swing. Handles 6 tools with one set-up. Many exclusive ADVANCED features. Cut-off cross slide also available.

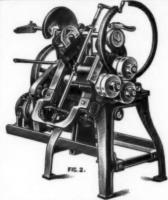
LYNN TOOL POST TURRETS

Self-indexing. For lathes with 12" to 28" swing. Holds 4 tools; indexes to 8 positions. Two indexing pins; tapered inserts. No cams to wear. Solid steel blocks—sizes 5¼". 6½". 8".—to fit your needs. Accurate, fast, rigid, sturdy. Easy to fit and set up.

PROMPT SHIPMENTS. Write for full details.

LYNN MFG. CO., 218 Elroy St., Minneapolis, Minn.





No. 14 Angle Rolling Machine

ROLLS ANGLES, TEE IRON, PIPE, FLATS, ROUNDS AND SQUARES CAPACITY-2'x2'x4' ANGLE

HERE IS A

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THAT HAS FOUND ITS WAY INTO

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segments form the jaws of the Chuck, which grip the work when the draw-bar pulls the tapered shoulder against the closing sleeve. Since the work recess is bored on the same set-up as succeeding operations in production, all work is thereafter chucked concentric without indicating each piece.

This chuck will handle work diameters from \(\frac{1}{2} \)" to 2\(\frac{2}{3} \)", and the thickness of the head permits its use for a number of different jobs, by boring each recess an added depth as shown on sketches. While especially suitable for 10" Atlas and Logan Lathes, they are made to fit the collet attachments of practically all lathes, and are also applicable to most milling machines using draw-in collets.

The makers are The Gilbert-Baker-Midlam Co., 38 N. Jefferson St., Dayton

2, Ohio.

THREAD GRINDING FILM

The Jones & Lamson Machine Co., Springfield, Vermont, announce completion of a sound motion picture entitled "Thread Grinding-Fully Automatic". It provides in 28 minutes a highly interesting and instructive demonstration of the setting up and operation of a fully automatic thread grinder.



Animation has been used to portray some of the more intricate and unique functions of the machine. The film should appeal, not only to prospective operators, but to all who are interested in the comparatively new technique of fully automatic production of precision ground threads, in either large or small lots.

Sixteen mm prints are available for circulation among educational institutions, trade school and associations interested in the subject.

DILLON DYNAMOMETER

Practically all shops have an overhead crane fall line, a portable truck crane, or an overhead chain hoist, but few shops have scales able to handle large weights. Often where such large scales are available, weighing bulky objects consumes much valuable time.

The Dillon Dynamometer, illustrated, when attached to crane hook as pictured, can be used as an extremely portable



scale of tremendous capacity. It requires only a few seconds to place chain or rope around objects and hoist them for weighing. Results are said to be accurate, and one man can often handle this work.

Dynamometer maximum hand remains at peak load for check-back, and main indicator hand resets itself instantly when load is released so that no time is lost.

Address W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago.

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S.

NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10° Table; Model E.L. 12° Table.

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Available LITERATURE

FOLLOWER MACHINE: All-hydraulic duplicating attachments, designed to produce perfect work and eliminate necessity of individual machining. Built for 1, 2, or 3 dimensional operation, easily attached to any standard lathe, shaper, planer, grinder or mill. Turchan Follower Machines, 8259 Livernois Ave., Detroit.

SOUTH BEND 9" LATHE CATALOG: Devoted to 9" Models A, B, and C, bench and metal column base types. Designed for machining small, accurate parts on production, toolroom, and general work. Complete with all data and specifications, South Bend Lathe Works, South Bend, Ind.

UNIVERSAL 3-WAY ANGLE-SET VISE: 3 separate angular adjustments, base, lower cradle and upper cradle, with 360, 90 and 90° swing, respectively. Universal Vise & Tool Co., Parma, Mich.

DELTA PRODUCTION MACHINE TOOLS: 1943 line of machine and woodworking tools and accessories. 52 pages of illustrations and detailed information on power tools. Delta Mig. Co., Milwaukee.

BAKEWELL TAPPING MACHINE NO. 0: "In presenting the new No. 0 the 'Four Freedoms' of precision production were kept foremost in mind", says the booklet, "freedom from lost time, scrapped material, unnecessary manpower and useless monetary costs." 8 pages with full specifications accentuate 8 time and material saving stressed. Bakewell Mfg. Co., 2023 Santa Fe Ave., Los Angeles.

GENERAL BULLETIN: Catalog information brought up-to-date—tool room and plain bench lathes, hand screw machines and grinders for laboratory, tool room and die shop manufacture of small duplicate parts. Bulletin 608, Rivett Lathe & Grinder, Inc., Brighton, Boston, Mass.

TWO-SPINDLE DEEP HOLE CYLINDER BORING MACHINE: Similar in design to Barnes No. 445 Deep Hole Drilling and Boring Machine. The new development is said to be used extensively by the aircraft industry for boring large airplane landing gear struts and recoil cylinders. No. 445. W. F. & John Barnes Co., Rockford, Ill.

HAMMOND CYLINDRICAL FINISHING MACHINE: No. 502. Cylindrical Grinding, Polishing and Buffing Machines, designed for faster finishing of 1/4" to 9" OD tubes, rods, bars and a wide variety of cylindrical shapes. Features relatively standard units adaptable either for use with grinding, polishing and buffing wheels, or arranged for contact-wheel and abrasive belts with Hammond's backstand-idler. Hammond Machinery Builders, Kalamazoo, 54F, Mich.

SOUTH BEND TURRET LATHES: No. 901. Covering the Series 900 and Series 1000 South Bend Turret Lathes as designed for high speed machining of small chucking and bar work requiring close tolerances. South Bend Lathe Works, South Bend, Ind.

THE BLAKE TAP GRINDER: Sharpens the chamfer on right- or left-hand taps with

MACHINING OF SPECIAL FITTINGS

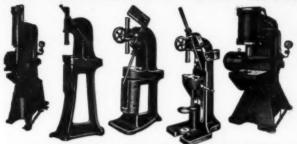
Most of your machining such as Drilling and Tapping operations are more easily done and at less tooling costs,

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SPEED UP FINAL OPERATIONS ON DIES. GOLBORNE Speed Lathes

For economical polishing, lapping or finishing of gears, shafts,

dies, gages, ball races, long rods, etc.

Built to meet the requirements of those desiring a heavy constructed, smooth running machine of highest quality.

Has large built in motor with variable speed control, using REEVES standard pulley and

Smooth automatic brakes act instantly when switch is thrown. Collets or chuck may be used.

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GOOD

2, 3, 4, 5, 6, 8 or 10 flutes. Two capacities, No.1 for taps up to 6" long and No. 2 for taps up to 14" long. Covers standard and optional features and attachments. Catalog No. 5 Edward Blake Co. 634 Commonwealth Ave., Newton Centre, Mass.

SHEFFIELD MICRO-FORM GRINDER: with Pantograph and Microscope. Designed to finish-grind any profile within its range directly from drawing. Advanced as suited for grinding circular and flat form tools, templates, profile gages, cams, dies, etc., from hardened materials including tungsten carbide. Said not to be limited by the regularity or irregularity of the work, nor by straight lines, circular or irregular curves. The Sheffield Corp., Dayton, O.

MOREY DEEP HOLE DRILLING MA-CHINE: Folder No. 743: describes this machine made in Duplex and Single Speed models, equipped for hydraulic feed or mechanical feed. Morey Machinery Co., Inc., 410 Broome St., New York.

HIGHER CAPACITY, FLEXIBLE CHIP BREAKER GRINDER: detailed completely in bulletin GT-158, by Carboloy Co., Inc., Detroit, 32, with photographs and descriptions of the machines in use for grinding both angular and parallel type chip breakers, and grinding breakers in roller turner tools. Also set-ups for grinding top, relief angles, and radius in boring bits, as well as for grinding flat form tools.

VICTORY POINTS: Abrasive mounted wheels and mounted points with demountable spindles that can be used over and over, saving critical materials. Standard grade and grain combinations. Bulletin ESA-65, Abrasive Co., Tacony & Fraley Sts., Philadelphia.

RECLAIMING CARBIDE TIPPED CUTTERS: 6-page bulletin, GT-157, on procedure in utilizing broken or worn undersized carbide tips—How to remove carbide tips from steel shanks, both silver and copper soldered—How to reclaim worn out HSS cutters by brazing carbide tips on the cutting edges—Detailed carbide tip to shank brazing procedure—How to make sandwich brazes and how to braze tips to multiple point cutters. Carboloy Co., Inc., 11139 E. 8 Mile Ave., Detroit.

TUNGSTEN CARBIDE TIPPED TOOLS: Folder and wall chart on four styles of tools, both right and left hand as well as pointed and square tipped, regularly furnished in Ugrade for cutting all materials except steel, such as aluminum, cast iron, bronze, nonmetallics, etc., and in S-grade for cutting steel. New England Carbide Tool Co., 60 Brookline St., Cambridge, Mass.

FINISH GROUND STANDARD CARBIDE TOOLS: Dimensions, carbide forms, clearances and prices on 4 standard styles of right and left-hand square and pointed tipped tools. Handy cardboard wall chart gives same in-



HART'S Divided Machine Vises



These Vises will hold work the full length of the table, if necessary. Use ful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The jaws are tool steel and hardened, the angle holding the work down on the table.



HART'S Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—%** to 4*.

HART MACHINE CO.
26 MATHER ST., DORCHESTER, BOSTON, MASS.

When writing for descriptive circular kindly mention the BLUE BOOK.

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Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lips.

We also manufacture angles and parallels as shown underneath surface plate.



We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. Write today for full information.

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ENGINEERS AND MACHINISTS SINCE 1907

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formation. New England Carbide Tool Co., 60 Brookline., Cambridge, Mass.

WALES PUNCHING & NOTCHING EQUIPMENT: Self-contained punch and die holder, permanent alignment of punch and die, independent holder for quick removing or resetting on rais, templates or T-slotted plates; unlimited patterns with same group of units. Wales-Strippit Corp., 345 Payne Ave., North Tonswanda, N. Y.

"LITTLE WONDER" RADIUS DRESSER: An inexpensive tool which can be a great aid wherever grinding wheels must be dressed quickly and accurately. To obtain a desired radius the diamond tools are first set a certain height from the bottom or top of the ground flat on a swinging arm. George Scherr Co., Inc., 128 Lafayette St., N. Y. C.

SPECIALIZED MILLING with GRAYSON-KENNAMETAL MILLING CUTTERS: Descriptive catolog concerned exclusively with milling metals with cemented carbides. Describes Grayson-Kennametal milling cutters and applications. McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa.

PUNCHING & CUTTING MACHINES, BENDERS, DIES, etc: complete catalog, No. 8, listing entire line, and special machines, with list prices and complete engineering data. T. H. Lewthwaite Machine Co., 311 E. 47 St., New York. WHAT IS DUPLIMATIC, AND HOW DOES IT WORK?: advanced as affording full, automatic control, to put intricate milling, turning, boring, shaping, die-sinking and like operations on high-speed production basis, by a simple method of converting variations in electrical impulses into hydraulic motion. Detroit Universal Duplicator Co., 749 E. Milwaukee Ave., Detroit.

HYDRAULIC POWER & TEST UNITS: 2 bulletins, one on power unit shows 10 models typifying use in conjunction with new machines or for change-over to hydraulics, for feed, traverse, indexing, locating, etc. Test unit bulletin shows models recently built for checking hydraulics before and after assembly. Included is portable model for field testing. Hydraulic Machinery, Inc., 13825 Ford Rd., Detroit.

UP TO 30 HP: illustrates how "Multi-Motor Mount" make practical adaptation of 3 Western Transmission models to any cone-driven machine. Models:—Master, 1/5 hp: Major 5/10 hp; Super, up to 30 hp. Installations pictured on lathes, shapers, millers, boring mills, etc. Western Mfg., Co., 3408 Scotten Ave., Detroit.

UNIVERSAL SLOTMASTER: new edition of 4-page catalog, illustrating some of the many ways it can be applied to save tools and setups. Shows conventional horizontal

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With this ingenius fixture you can now form your tools instead of form-dressing your grinding wheels, quickly grinding radii or angles on both cutters and fluted tools. Simplifies sharpening and

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MULTI-SWIVEL VISE

Fully universal . . . three swivels simplify the setting of compound angles. Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or multi-swivel vise.

The Platen greatly in-

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

WRITE FOR INFORMATION

MASTER TOOL CO.



and angular setup, with description of tooling for cutting an internal gear, chuck jaw teeth and feed cams—broaching splines, lapping deep impression dies, etc. Experimental Tool & Die Co., 12607 Greiner, Detroit.

CLARK ADJUSTABLE CUTTERS: Designed to cut accurate, clean holes, quickly, in boiler plate, pipe, plastics, hard fibre, stainless steel, and "'problem" materials. Covers variable expansions from 5/8 to 5" holes in thickness capacities from thin sheets to 1". Robert H. Clark Co., 3424 Sunset Blvd., Los Angeles.

MANUFACTURING BLANK AND PIERCE TEMPLATE DIES: Fabrication of dies from templates of the parts themselves, eliminates special die design, simplifying engineering alterations and saving time and cost of conventional dies, Algoma Products, Detroit 12.

TOOL CATALOG: Counterbores, Reamers, Rey Seat Cutters, Laps and Arbors, Tapers, Basic Thread Dimensions and Tap Drill Sizes, Decimal Equivalents, and valuable shop data. Arnold Tool Co., Cleveland, 12.

HANNA ENGINEERING CATALOG: Information on Hydraulic Cylinders details for quick selection of exact cylinder for specific application. Includes mounting arrangements, schematic drawings and dimensions of each model, velocity of piston alignments charts, and chart of capacities, with other important

and valuable engineering data. Hanna Engineering Wks., 1765 Elston Ave., Chicago.

HEAVY DUTY BENDER-CUTTER: for forming of intricate shapes of flat or round cold rolled or spring steel. Especially useful for bending samples and short runs of 100 to 200 pieces. Complete with forming dies and mandrels. J. A. Richards Co., Kalamazoo, 13F, Mich.

THE MICO ENGRAVER: Versatile pantograph machine adaptable to many lettering tasks associated with experimental work, as well as routine production of panels, nameplates and small parts. Mico Instrument Co., 80 Trowbridge St., Cambridge, Mass.

ROUSSELLE PUNCH PRESSES & AD-JUSTABLE SPACERS: Complete catalog of punch presses, precision vises, adjustable milling spacers, giving full engineering specifications & details, on tools specifically designed to save time on production work. David J. Ross Co., Inc., Ross Pk., Benton Harbor, Mich.

BARCO "MEEHANITE" SURFACE PLATES: Mechanite, an engineered high test cast iron said to eliminate many general objections to cast iron. Selected in construction of Barco Surface Plates, because claimed to give physical properties accurately controlled, uniform strength, solidity, absence of shrinkage porosity, exceptional rigidity and other

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We are closing out the following list of Stay Bolt Taps at drastically reduced prices.

Subject to prior sale.

Quantity	Diameter	Throads Per Inch	Length		Price Each
117	36"	12	18"	Whitworth Spiral	10.80 Less 45-20
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33	11/4"	12	18"	Whitworth Spiral	15.60 Less 45-20
28	3/a"	12	21"	Whitworth Str. Flute	10.80 Less 45-20
40	7/8"	12	22"	Whitworth Str. Flute	10.80 Less 45-20
48	1"	12	18"	Whitworth Str. Flute	13.20 Less 45-20
30	7/4"	12	18"	V Thread	10.80 Less 45-20

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THE NILSON AUTOMATIC METAL AND WIRE FORMING MACHINE



The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

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FLEXIBLE DRIVE SOCKET SET

FLEXIBLE SCREW DRIVER

MILLER FLEXIBLE SCREW DRIVER—A practical, durable screw driver that actually "works around corners." One of the most valuable small tools ever put into a shop.

Saves loss of time and temper on jobs in awkward places that can't be reached by a straight or offset driver.
Laminated steel shaft; specially hardened screw driver
bit. Shock-proof handle. Length overall 8". Price, 85c.

Efficient in production and assembling operations or for servicing small machines

MILLER FLEXIBLE DRIVE SOCKET SET—Same construction as Screw Driver. Set contains 6 Hex Sockets from 3/16" to 1/2" and flexible drive 10" long. All packed in handy metal box. Price, \$3.00.

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> You'll wonder how you ever got along without it.

The Marshke Line leadudes Pedestal Type, Fluor Stand and Grinders a n d Buffers in ever 70 stand and and apecifications. For AC and DC gener with mefor sizes from 1 to 40 M-P. and with 107 2 30° wheels.

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5 and 7½ H.P. Narrow Type Pedestal Grinders

Made for 16", 18" and 20" wheels. They have magnetic push button control and are equipped with Marschke Universally Adjustable Guards. All adjustments are made with permanently at-

tached handles for speed and convenience of operation. Has overload and undervoltage protection. Sturdy machines for severest operating conditions. Also used for general utility machines and for production grinding of small work pieces.

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1823 Madison Ave., Indianapolis, Ind.

esirable features. Barco Scraping Co., 1975 L. 65th St., Cleveland.

RC WELDING IN WARTIME REDE-IGN: By S. Birkland, Ass't. Chief Draftsan, American Can Co., San Francisco. Case istory of a redesign to save weight and ritical metals. Reprinted from Metals & Aloys, April 1943, and available from Jas. F. incoln Arc Welding Foundation, Cleveland.

ASTOLIN EUTECTIC WELDING AL-OYS CHART: Contains all details relative low temperature welding alloys in clear tief form. Eutectic Welding Alloys Co., 40 Yorth St., New York.

AV-WAY MASTER SETS: details master tes of standard plug gages for hole inspecon, in increments of 64ths, starting at 1-4 ad going to 1". Three pluge each of nominal ze, 0005 over standard size, 0005 under—all ald to gage-makers (X) tolerance. Sav-Way adustries, 4871 E. 8-Mi. Rd., Detroit.

TUDLER ANGLE COMPUTER: Saves me on layout of die work, survey of castegs and inspection of precision-machine arts. Only one set-up of the work is requiri, since surface plates may be rotated 360 egrees in each of 3 separate directions of tation: horizontally, vertically, and radilly. Angle Computer Co., 5722 Melrose Ave., os Angeles.

HELPING YOU GET THE UTMOST FROM YOUR PROJECTION MEASURING EQUIPMENT: Describes details—Engineer's-Giass. Selected plate glass one-eighth ineh thick, with carefully ground edges, on which excellent drawing paper has been securely cemented. Fulfills definite need for medium on which accurate diagrams can be drawn, retaining original accuracy, for placing directly on viewing screens of comparators and other micro and contour projectors. Engineers, Specialties Division, The Universal Engraving & Colorplate Co., 588 Monroe Street, Buffalo, New York.

FABRICATED PIPING: Illustrative of many applications available. Highly interesting, illustrated book by well known pipe fabricating firm. Covers various ways in which piping can be used and lists present market prices for every conceivable kind and size. S-4, Flori Pipe Co., St. Louis.

LIVERMONT TORQ-SNAP WRENCH: Designed for proper torquing in assembly and maintenance of aircraft and other products. Each wrench preset to proper load for nut is designed to fit. Gives audible "click" when desired load is reached. Tubing Seal-Cap, Inc., 215 W. Seventh St., Los Angeles.

SQUIRREL CAGE INDUCTION POLY-PHASE MOTORS: 6-1, Form 344A. Data on motors best suited for specific application.





Get BEVERLY Throatless SHEARS

SAVE TIME ON WAR ORDERS!

If you're cutting straights or irregulars on War orders you can speed 'em up with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16⁸ mild steel and 10 ga., stainless.

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/6 to 600 hp. 5 different types of construcion: Continuous duty; open rated generalsurpose; splash-proof; totally enclosed fancoled; explosion-proof and enclosed motors. century Electric Co., 1806 Pine St., St. Louis.

LOWERLESS FURNACES: No blower, o compressed air, no electrical control equipment. One connection to gas line is all that a necessary for installation. Reaches up to 900° F. few minutes after lighting furnace. Cahr Mfg. Co. Div. Diamond Iron Works, nc., Minneapolis.

TEEL-TEMP HARDENING SOLUTION: older outlines merits in field of steel hardning solutions. Said to eliminate need of empering and to afford advantages in speed, ardness, safety, toughness, ease and simpliciy. Steeltem Chemical Co., 51 E. 42nd St, sew York.

HIPS WELDED ON A PRODUCTION INE: Reprints of article appearing in Metal trogress, April 1943 by George F. Wolfe, hief Plant Engineer, Engineering Works iv., Dravo Corp., Pittsburgh. Available from ames F. Lincoln Arc Welding Foundation, Ileveland.

ROTECTIVE COMBUSTED ATMOS-HERES IN HEVI DUTY FURNACES: Deals with atmospheres having combusted as base as distinct from those formed by direct cracking of raw gases or hydrocarbon oils. Offers two types—with internal combustion chamber and gas curtain—atmosphere prepared within the furnace body; 2—Equipped for use with externally prepared atmosphere. HD-643—Hevi Duty Electric Co., Milwaukee.

PREPARATION OF IRON, STEEL FOR ZINC AND BRIGHT ZINC PLATING: No-how material aimed to aid in face of increasing shortage of cadmium. Covers degreasing and procedures for pre-soaking and cleaning surfaces before application of bright zinc coatings. Special help to those now using this type of finish in war work. Oakite Products, Inc., 22 Thames St., New York.

RANSOME TURNING ROLLS: Illustrates and describes turning rolls for facilitating welding large cylindrical tanks and drums. No. 188. Ransome Machinery Co. Dunellen, N. J.

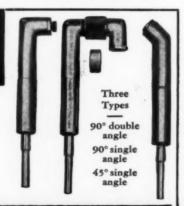
ARC WELDING TOOL STEEL WITH STAINLESS ELECTRODES: Reprint of article by H. W. Rushmer, Jeffrey Mfg. Co., Columbus, O. in Iron Age, March 11, 1943, available from the James F. Lincoln Arc Welding Foundation, Cleveland.

(CONTINUED ON PAGE 404)

Invincible Sky Tools Wear Better — Last Longer

Invincible Angle Drill Attachments reach "hard-to-get" spots, saving time and expense for you. Quickly and easily installed and serviced on the job. Patented thrust ball takes the wear instead of gears. Check Invincible today!

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"PORUS-KROME"

Recent removal of censorship restrictions, has permitted the release, by the American Hammered Piston Ring Division of Koppers Co., of an outstanding example of the "tremendous trifles" which are playing such an important part in American war

By plating airplane piston rings with .005" of chromium (about thick-ness of a sheet of book paper) on the cylinder contacting sur-face, our fighting aircraft have been able to fly five times as many hours between engine overhauls, even in Africa where the abrasivelike dust of the desert apparently has no ceil-

Tightly locked on special arbors, the piston rings are low-ered, by an overhead traveling crane, in-to one of a long series of tanks.

Said to be the largest chromium plating department in the world, the operation is based upon the Van der Horst Process, which American Hammered pioneered in this country. While experimental work pre-dates the war, the present depart-ment with its block-long line of plating tanks and generators, was planned im-mediately following Pearl Harbor, and has been in actual operation for over a year.

The "chrome" on airplane rings is not the bright, hard, plating used on auto-



our pump catalog. Copy forwarded upon request. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE PUMPS

mobile bumpers. Instead, it is known as "PORUS-KROME"-gentle on cylinder walls, permitting ample lubrication and yet resisting wear to an extent that, if applied to industrial Engines in post-war days, has long-life potentialities beyond any piston ring set-up ever known in the trade.

> Carelessness Is Sabotage — It's Difficult to Replace Cutting Tools.



In bright contrast to the Nazi dictum is the fact that without benefit of orders or directive, the fruits of years of study and experion were pooled in the automotive industry within a few weeks after Pearl Harbor.

In less than three weeks, the one-time competitive companies in the industry had worked out a system to facilitate the sharing of their production secrets. Their technicians met at regular intervals to exchange ideas and demonstrate shortcuts, a practice which continues. Other industries, too, shared in the pool of "know how."

The cooperation has been real, as some of the little known stories, now coming to light, indicate. Pooled "know how"

Pooled "know how" of formerly competitive companies has been one of the chief factors in the automotive in dustry's very successful search for substitute materials to supplant those made critical by wartime shortages.

For example, take the small brake cylinder piston for military vehicles. Though many companies were experimenting with alternate materials for this item, little progress was made until the Pearl Harbor attack brought all companies together.

The individual research on this project then was pooled, with the result that brake cylinder pistons soon were being made from new materials which satisfactorily replaced those formerly used.

Contents of this publication may be reproduced or quoted. Mats of the illustrations available on request. Automotive War Production.

VOLUNTARY COOPERATION

To German Industrialists: Experience of arms factories must be pooled. A policy of keeping one's production me thods secret will no longer be tolerated. I have ordered all war plants merged into rings so that every producer will obtain the benefit of the most efficient methods. Herr Doktor Albert Speer, Minister for Munitions and Armaments.

The above proclamation, issued 41 months after Germany entered the war, indicates that the Nazis are striving to achieve by coercion what America does by voluntary cooperation.



SURFACE GRINDERS

Hydraulic Feed — Hand Feed

No. 2 HAND FEED 6x22

No. 2 HYDRAULIC FEED 6x22

No. 22 HYDRAULIC FEED 8x24

AMERICAN DRILL GRINDERS

LA SALLE TOOL CO.

77 W. Washington Street CHICAGO, ILL.

Manufacturers of Dependable Grinders for Over 25 Years







ONLY THE BEST deserves such packaging

There it is—a beautiful cutting tool, accuracy personified in every shining thread, inspected for the last time and ready to ship. . . . Each Threadwell Ground Thread Tap is enclosed in a transparent plastic tube that keeps out dirt, that protects each thread with a rigid armor of plastic, yet a wrap that allows instant identification of size and style. . . . You can tell a Threadwell Tap by the dot on the shank, the individual plastic container.

and by its outstanding performance on your production line. . . . Have you: "changed to Threadwell"?

EXPORT STOCKING DISTRIBUTORS
CANADA: Bridge Macking Co., Maniped
ENGLAND: Strips Ltd., Landen



THREADWELL TAP & DIE CO., GREENFIELD, MASS., W. S. A., FOUNDED 1902

ATTACHMENTS

So many tools and attachments have been devised for speeding metal-working operations and doing particular jobs that one must keep on his toes to keep up half-way with them.

At the turret lathe, many now enjoy the benefits of a tool called a multiplecutter turner. It can be used to turn as many as four concentric diameters at one time. Not alone for the speed it offers in operation, but also where true concentricity is at a premium, such tools are highly valuable. They have been put on the market by a wellknown builder of turret lathes.

In grinding, a suitable attachment has opened the way to the grinding of slots. recesses, and surfaces ordinarily difficult of access. Both accuracy and ease of operation are obtained by mounting such attachments on various makes of surface grinders. They are available in models with horizontal spindles, and also with vertical spindles. The spindles can be shifted to numerous positions. By their use, a wide variety of die, tool, gage and other grinding readily may be handled on a surface grinder.

Just as either the horizontal or vertical aspect in such grinding may be covered by use of a horizontal or vertical grinding attachment, so the vertical or horizontal holding of work of round type may readily be done with a combination horizon ho

tal-vertical collet index fixture employed in a good many places.

This fixture, housing the holding and indexable collet, is fitted with two different bases, at right angles to one another, so the collet can readily be mounted in either horizontal or vertical position and made fast to the table of any miller, grinding machine, drill or shaper. A lever is incorporated for quick opening and closing of collet.

One most interesting lathe attachment is a telescopic taper attachment.

FLEXIBLE ABRASIVE WHEELS

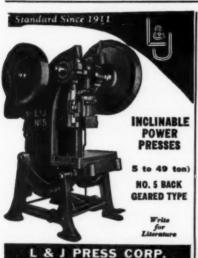


Designed for precision work where flexibility is required, these wheels are useful accessories for sanding and finishing regular and irregular jobs, penetrating into difficult recesses, lapping boles in dies. finishing various shapes of metal, wood, rubber and plastic parts.

Useful for finishing propellers in aircraft construction. Descriptive bulletin and sample wheel will be sent on request. Prompt Deliveries.

FIELD ABRASIVE SPECIALTY MFG. CO.

DAYTON, OHIO



TANNEWITZ High Speed METAL CUTTING BAND SAWS

Fastest and best known mans of cutting sheet steel, aluminum and magnesium sprues, gates, rissers, and kindred items. Provides saw blade travel of over 2 miles per minute with perfect safety. Cuts are exceptionally smooth. Labor savings ranging from 25% to 90% are the usual thing.

Send for bulletin on the above. Also bulletins on Foundry Band Saws; Di-SAWS.

Built by Sawing Machinery Specialists



THE TANNEWITZ WORKS GRAND RAPIDS, MICHIGAN



ELKHART, INDIANA

BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¼* wide may be welded.

1 KVA-110 Volt-60 Cycle-single phase-5 point heat control-1 point anneal heat— Weight 40 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Soum, Flush, Projection and Special Welders.

WELDEX INC., 7325 MeDONALD AVE.

1625 STERLING AVE



No delays — a new gage always at hand for instant service.

DUBLIFE Reversible PLUG GAGES

When one end either "Go" or "No Go" indicates wear, all you have to do is reverse the plug, bringing new end into use. Change easily and quickly made. Tapered bronze collet locks plug securely in handle. Dublife insures accuracy at all times — doubles precision life!

SEND FOR COMPLETE GAGE CATALOG

Shows complete line of UPPCO-lapped DUBLIFE, and other gages of A. G. Design. Full engineering data. Wire or write

UNITED PRECISION PRODUCTS CO.

3522 W. BELMONT AVE.,

CHICAGO 18, ILL.

BAND SAWS

Horizontal metal-cutting band saws are much used for cutting off jobs. They are especially good for the purpose, some of them furnishing cutting capacity for large stock.

One firm, building metal cutting bandsaws of this kind with enclosed dirt-proof gearing that is sealed for life, hydraulic lifting or frame control, a work-holding vise that can be quickly set by the throwing of a lever, and automatic cutoff feed, has produced machines of two different capacities. One handles stock 8"x16", the other handling material up to 8"x24". These machines may be castermounted if desired, which of course makes them portable, for use anywhere in the shop.

Admittedly, much of the performance of the best metalcutting band saws is due to the use of efficient band saw blades. If the steel is not what it should be, or if it has not been properly milled and set, the highest class machine can show only a mediocre result. Band saw blades, therefore. should be bought only from those with years of experience. There are many firms in this category.

One horizontal metal - cutting bandsaw has a 4speed motor of 1/2 hp capacity built into the frame, receiving power from a light socket, and is readily portable. Cutting pressure is readily controllable, so there is not the usual heavy burring when sections of thin-walled type are being cut. Angles, tubes, rods, heavy rounds and all kinds of ir-

regular shapes can readily be handled on this machine.

One firm which has specialized heavily in the manufacture of metal-cutting band saws has provided no less than three horizontal models, designed for handling work of different sizes.

The largest or heavy-duty model has hydraulically-controlled feed and lift for the frame. This is a stationary machine, and a medium-weight model. Then they have the lightest model portable, and have designed it to cover maintenance work and utility jobs.

TAP LIFE INCREASED

PRODUCTION INCREASED 20% SCRAP REDUCED 56%



S. F. BOWSER & CO., INC.

FILTRATION SYSTEMS FOR

- O CUTTING OILS
- @ COOLANTS
- . HONING OILS
- @ GRINDING OILS
- . BROACHING OILS
- MANY OTHER



LIQUID CONTROL SPECIALISTS - SINCE 1885
METERING - DISPENSING - STORING - LUBRICATING - FILTERING - DISTILLING



LITTELL Automatic Centering Reels are constructed with four arms which operate all at the same time. A free loop of material is supplied to automatic feed, regardless of weight of coil.

Littell Reels are made in 100-lb, to 20,000-lb, capacities. Automatic spindle and cradle types. Plain and motor-driven. Used in thousands of plants for faster

production.
Other Littell products include Roll Feeds, Dial Feeds,
Magazine Feeds, Air Valves, Straighteners, Scrap
Winders, Pres-Vao Safety Feeders, REQUEST
Mochanical Pickers, etc.
BULLETINS.

F.J. LITTELL MACHINE CO.

WATER removed from AIRLINES AUTOMATICALLY WITH THE MURPHY SEPARATOR

AR OUTLET



Sizes 1/2" to 4" Pipe

Literature and Prices on request.

RESULTS - - - GUARANTEED

NO ABSORBENTS - NO CHEMICALS

IAS. A. MURPHY & C



Significant in broadening of the field of boring, are the firms engaged in building boring machines in wide array of madels.

Manufacturers usually built either a geared-feed machine or a hydraulic feed, a horizontal borer or a vertical type. Now, at least one firm supplies all these and in addition provides high production attachments to go with them. Or it furnishes either plain or compound tables for a wide range of work.

Large combination machines especially desirable for large work, also include facilities for other operations, and are made by different builders, though differing somewhat in design. They have in common. however, a hori-zontally-travelling table, and a vertadjustment ical through considerable scope for the massive horizontal spindle. One such machine is provided with a 30-inch vertical movement for the spindle, which is 3%" diam. the center of the spindle dropping below table level at the low adjustment limit.

In addition to heavy-duty boring, it is adapted for milling, drilling, and tapping. Table has full 60" cross travel, and milling cuts of considerable length may be made. Somewhat similar machines are also built by other firms for somewhat smaller work, but adapted for both boring and milling.

Precision boring machines are often built in horizontal style. Some firms have gone a long way in herizontal boring machine de-

sign, furnishing models adapted for different kinds of work.

Some are single end machines fitted with either single or double spindles. Others are double-end machines for high production, fitted with three or four spindles. In addition, knee type boring machines are available, 3-way or 4-way or angular types as needed.

Such a range naturally allows one to select a machine adapted for almost any boring job that arises.

One such machine locates, precision bores, and checks the finished work.

New Models! New Designs! New Efficiency!

ERICKSON PRECISION

COLLET CHUCKS



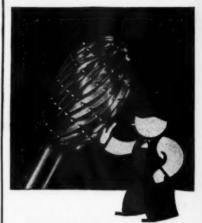
This Chuck, f a m o u s throughout industry, now available in a complete range of sizes and shanks. Adaptable for use on all type of production equipment.

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ERICKSON STEEL CO



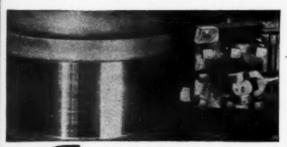
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To get real production on the finishing of metal castings, dies or patterns, you need the kind of rotary tools that take deep sharp bites. Yeomans Tool Regrinding Service puts your worn tools back in topnotch shape—makes them sharptoothed and hard biting. For prompt service and a good resharpening job on your Burrs, Die-Sinkers, Reamers, Drills, End Mills and Milling Cutters of any size, shape or quantity send them to:



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CROBALT SOLID AND TIPPED TOOLS

● CROBALT solid and tipped tools are available in standard and special shapes and sizes. Whatever your operation—turning, facing, boring or milling—CROBALT superior cutting tools will provide longer tool life, maximum machine output and long-run economy. CROBALT maintains a staff of engineers to assist you.

Write for catalog and prices.

CROBALT INC.

ANN ARBOR, MICH.

PUNCH PRESS GUARDS

Punch press guards as made today are something more than guards.

One firm making a device of this kind has even advertised in this vein, saying "It's more than a guard." A more fitting name would probably be "safety devices". For modern press guards are designed to protect the hands of the operator against the dangers of the descending press ram.

It is possible for any designer to make one mechanism operate another, and since the danger is always linked with descent

of the ram, some safety devices are designed so that as the ram descends, it positively actuates a swing-ing arm. This arm sweeps across the entire length of the bolster plate on the downward stroke of the ram. Thus, if the operator has his hands in the danger zone, they are mechanically and forcibly swept out of that zone by the action of this safety device.

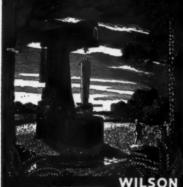
Compressed air comes into the picture in some cases. for there are many presses arranged so that compressed air operates a special guard and die enclosure with which the press is fitted. Compressed air also operates to actuate the press ram. The die enclosure has a gate at the front, which rises to allow placement of work. Arrangement is such that even a finger under the gate prevents operation of press. In consequence, the ram can descend only if and after the operators hands have been withdrawn from the danger zone.

Other guards which use a gate for guarding hands of operators, are so arranged that a triple interlock provides the safety feature. In short, ram cannot operate unless the gate is down and the operator is out of the danger zone. With this layout there is incorporated a non-repeating device which limits the press to one stroke at a time.

Another clever device fully protecting hands, has two hand levers placed out of the danger zone, but so arranged that operator must have his hands on the two levers before the press can be tripped.

(Note: Machines or devices mentioned, identified on request .- Ed.)

NTING DOGS WITH TERS OUR ROCKWELL HARI ND MECHANICAL SEARCHE MPROVED PROPERTIES IN MET



WILLING - DRILLING - BORING

for

Heavy Duty Operations

Uses many types of cutters on a wide range of work. 1/16° to 3/4° end mills.

FEATURES

Large size spindle with No. 9 B&S Taper. Large Quill Diameter with a travel of 4°. Furnished with 1/2 h.p. motor.

The aluminum pulleys provide a range of six speeds, from 250 to 3000 R.P.M. The spindle takes 1/16 to % end

mills. Quill is counterbalanced and hardened and ground. Overarm brackets equipped with spreader screw for easy mounting.

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Simplex Machinists' Jacks speed leveling of work on planers, milling machines and other machine tools. Notched base for fastening to bed. Self-leveling ball and socket cap. Side lock nut holds screw at desired height. 4 sizes: 234", 334", 51/4" and 71/2" closed heights.

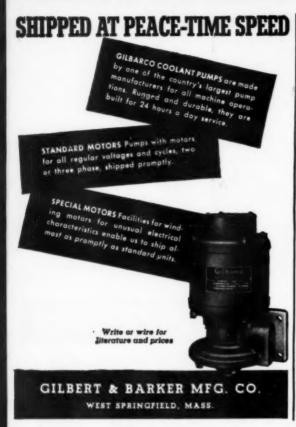


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Templeton, Kenly & Co. Chicago, Illinois

Better, Safer Jacks Since 1899





VARIABLE SPEED DRIVES

Variable speed drives have been given a great deal of attention in recent years, have been produced in various forms by different manufacturers, and have had wide application thruout industry.

In this respect, the machine tool field has by no means been left behind. One of the most compact forms of variable speed transmission is made by placing into a single housing a driving motor, necessary reduction gearing, and variable-speed disks connected by a suitable belt. Speeds may instantly be changed to exactly what is desired, by turning a micro-control wheel on the rotor. If de-

sired, remote control may be arranged from any point suited to the operator. Horizontal milling machines and various other machine tools have been fitted with this device to high advantage.

This type of variable speed drive has been successfully fitted to a single spindle Gridley automatic screw machine to advantage by a firm specializing in screw machine modernization. Drive is placed above the machine, and saves taking up additional floor space. It fur-nishes speeds over a wide range, a highly useful feature in screw machine prac-tice, where it is so helpful to be able to bring the surface speed of the work to exactly the point that has been computed as ideal by engineers.

Applied to the screw machine, this drive has a Syncrogear built into the motor, which drives the feed of the screw machine. It maintains proper relative speeds.

The interconnected magnetic controls are arranged automatic-

ally to stop both variable-speed drive and the Syncrogear, should either stall.

If you interpose a roller between 2-plate type or disk-like members, holding the roller in an adjustable mechanism that allows it to be radially adjusted at the will of the operator, driving one of the plate or disk members at constant speed by means of a motor, you have the means for obtaining infinitely-variable speed at the output shaft within the limits of the device.

While it is not quite so simple as it sounds, some firms have produced a highly successful variable speed drive

by this principle.

T. H. L. FRONT LEVER

BENCH PUNCH

Built for hard, tough work—die can-PRICE WITH ONE PUNCH AND ONE ment with

\$50.00

not lose alignment with punch — all parts interchangeable.

Capacity — 1/2*holesthrough 3/16*steel; 13/32*through 1/4*steel. Can also be made for holes up to 7/8*in thinner metal. Stock punches and dies available from 1/16*to 1/2*by 64ths. Weight, 70 lbs.

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ers in setting dies. No wrench needed. Six hardened screws nested in holder (see below). Uniform height hex base to point, insuring clear uniform indentations.

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3/16" ...\$1.50 1/4" ... 1.20 5/16" ... 1.25 3/8" ... 1.35 7/16" ... 1.40

3/8" ... 1.35 7/16" ... 1.40 1/2" ... 1.50 Also

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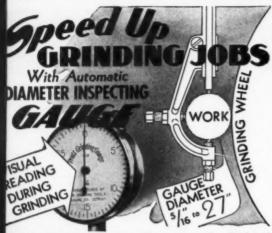
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Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

Send for Bulletin

DIAMOND TOOL & GAUGE CO.

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CENTERLESS GRINDING

The centerless grinding machine, ordirily encountered, has three principal rts that permit generation of round rk without use of centers:— grinding seel, blade, and regulating wheel.

However, it is interesting that one firm s departed from this method of design the extent that grinding is done with abrasive belt. It is not meant to subtute for the larger and more accurate chines, but is well adapted for handg cylindrical work from 4" to 1" in meter, whether metal, wood, fibre or her material. The machine is also adapt-

able for straight line finishing on flat work.

Larger standard centerless grinding machines as made by leading builders offer much to increase profits on grinding many types of parts. Ability to raise production is usually markedly present, for operation is practically continuous, especially on even-section stock that can be passed through the machine. Less grinding stock is required, which means that less time is needed to remove it, and less wear on the grinding wheel in doing

Maintenance costs are low. Setup time is usually much less than in other methods of grinding.

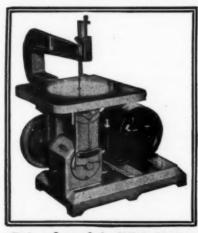
The regulating wheels used at the centerless grinder are the sizing element, and in the past a great deal of rubber was used in them, due to the property in rubber which causes it to grip a surface, thus making a splendid feed wheel for a centerless grinder.

centerless grinder. Shortage of rubber led engineers to look for other materials which could be logically substituted.

At least one good substitute has been found by one firm specializing in regulating wheels. It is claimed that wheels made from this material require less dressing, are more economical, hold shape longer, and end worry about rubber shortage.

Did you know that blades for centerless grinders are now given exceedingly long wearing qualities by tipping their upper edges with tungsten carbide? The upper edges are machined with a channel to receive the tungsten carbide.







Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The holddown fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

Price Complete With Motor \$125.00

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CHICAGO

ATLAS EQUIPMENT CO.

October, 1943

MACHINE TOOL BLUE BOOK

369



THE FEDERAL PRESS CO., 810 DIVISION ST., ELKHART, INDIANA

PROPELLERS

The extent to which a manufacturer oses in making his own airplane propellers will naturally depend upon how fully he is equipped for the purpose, or on how much floor space he can allot to equipment.

It is possible to purchase propeller hubs separately, for instance, and if the plant is overcrowded, it may pay to do this. Where there are large numbers of propellers to be made, it will certainly pay carefully to consider the special types of equipment on the market, and which

have particular reference to propeller manufacture.

One interesting piece of equipment is made for milling edges of propeller blades. The machine is fitted with a hydraulic duplicator attachment, controlling cross movement of two vertical spindle heads. Heads are mounted on a cross rail, and machine edges of propeller blades simultaneously.

A two-sided cam is attached to the traveling machine table, and the hydraulic duplicator has fingers riding in contact with the cam. In this way, contour of cam, working thru duplicator, generates proper shape on blades by controlling cross-movement of the two cutterheads. Altogether, this is a highly ingenious and productive machine.

Propeller grinding benches are used in some places, providing facilities for holding workpieces, while being ground

with a portable grinder. Such benches, to offer utmost in convenience, and make it possible for grinder dust to be carried away, are usually furnished by firms that have specialized in dust controlling equipment. The war has called many special devices into use, and this one is playing a real part in accelerating the production schedule.

When one gets into manufacture of propellers, he gets into something involving accurate angles, and in order to check such angles properly, precision instruments are needed.



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Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

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good job powering machines for defense production. No noise, floating cone, results 100% power. 8 years of production

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SHAPERS, MILLERS, ETC. IMMEDIATE
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Angle plates for boring mills, drills, lathes, grinders, layout, inspectors, vee blocks, parallels, surface and lapping plates.

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What Do YOU Know About Work Expedition?

There are many ways to use cotton bags in speeding up both shipping and production. Why not investigate their possibilities? Send for FREE reprint: "Cotton Bags in Work Expedition" and for FREE samples. Bags shown here save a lot of time and money in ordinary shipping, too.

THE AMES BAG CO.





Some lathe dogs are made in twopiece type, two machine screws being
employed to pull
the jaws together.
Positioning n ut s
provided to be a ragainst tailless half
of the dog. By rumning these nuts to
a wanted position,
overhanging en d
so of the screws may
be equally divided,
reducing danger to
minimum.

As for the onepiece lathe dogs, some have only one screw for holding work. But others, for heavier service, have two screws arranged in V-formation.

Milling machine dogs designed for taper work carried between centers, may be obtained with a flat tail that works in the headslot without allowing backlash. They are fitted with one square-head set-screw, and sufficient metal is provided in dog-body where the screw passes through, to allow re-tapping once or twice, to receive larger screws for repair, as the threads

One firm retains the advantage of the square-head set-screw, and has at the same time far reduced the hazards attendant upon use of such screws. This has been done by enclosing the square-headed setscrew within a so-called safety cap, cap being hex type so made that it will turn with a wrench. The inside of this safety cap is shaded to conform to the head of the setscrew, so the setscrew turns with the cap, sliding up or down inside as the cap is turned.

(Note, Machines or devices mentioned, identified on request.—Ed.)

DOGS

Drop-forged lathe dogs, both straight tail and bent tail, are often provided with hollow-head safety setscrews. When furnished by leaders in this line, they are always sent with the safety type of screws unless otherwise specified.

However, they can be drilled and tapped for ordinary square-headed setscrews to special order. These screws may be set up somewhat more firmly on the work, with sacrifice of the safety feature. One may take his choice of the feature which he considers more valuable.



The fate of the Axis leaders is being written right now in American war plants! The more that can be produced ... the sooner it can be gotten to the lighting fronts ... the sooner will that day of "unconditional surrender" arrive. To help do the lob. many war plants are using Bowser Filtration systems to keep cutting oils. coolants, grinding oils, honing oils, broaching and thread cutting oils clean. By doing this, many of them report production increases ... of 27% ... 42% and more scrap reductions of 40%, 60%, 80%; less man power and in some cases, with fewer machines. Maybe we can help you, too. A call will put us on the job. Why not do it now?

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Graduations are in .0005° per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes— 5½°212°, 3½°20°.

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BENCH TOOLS

Machine tools in bench types and sizes fill a growing demand. It is usually not economical to use a large machine tool for work that can be done as well on a bench machine. Four-ton capacity punch presses of inclinable type, for instance, are readily available.

One has a 6"x8" bolster plate, and overall height of 25", providing 285 strokes per minute. Its maker also builds a vertcal milling machine of bench type, which s e a sily fitted with a horizontal milling attachment.
Bench arborpresses of directleverage type are
convenient where
there is not much
work to keep a
large arbor press
busy. In cases
where arbor press
e q u i p m e n t
on hand is overloaded, bench arbor presses will
draw off some of
the lighter work.

Direct leverage arbor presses of bench type may be had in two and three-ton models, equipped with a snap ball check which permits the ram to be spun down into contact with work very quickly. Many jobs of assembling, dis-assembling, dis-assembling, dis-assembling, dis-assembling, dis-assembling, dis-assembling, bending and straightening can be performed to advantage on these little presses.

It may be that you do not have sufficient work to keep a punch press of bench type profitably engaged, and yet have alot of holes to be punched now and then, which can be done to advantage on a good bench

punch. Such may be had, and may be used in combination with stock punches and dies, varying in size from 1/16" to ½" in increments of 1/64". Sufficient power is available in such a punch for ½" holes through 3/16" steel, or to 13/32" through ¾" steel. Similar punches may also be made for punching holes up to ¾" in thinner metals. Design is such that the die cannot lose alignment with the punch.

On the whole, bench type grinders are not uncommon.

(Note: Machines or devices mentioned, identified on request .- Ed.)

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15" — 185.00

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SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table

swivels and locks in any position. Can be varied 151/2 by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

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In mechanical production, as in every other branch of the war effort, precision is more important than any other two factors put together (except quantity, perhaps). A part or a product that's just a "little off" can cost a plane, or a ship, or a regiment!

ELECTRIX Gages authenticate precision production to within .00005 of absolute. Their known accuracy is a matter of record in important ordnance centers.

We make 33 types of Gages, but stock none. Every Gage is custommade to the precise specifications indicated for the authenticating job to be done.



ELECTRIX

Peace-time engineers of soft-rubber connector for electrically-operated equipment MIDDLE ST., PAWTUCKET, R. I.

RIDE-SHARING PLAN

Tightening of gasoline rationing lends interest to a successful ride-sharing plan for an industrial plant described by E. V. Ekman, board chairman, Electrolux Corp.

Installed in the firm's Old Greenwich, Conn., plant by its originator, Edgar P. Senne, it has e liminated managerial guesswork in certifying employees to ration boards for extra gasoline and tires.

Heart of the plan, and secret of its rapid and efficient operation, is a wall chart and large, detailed map. Garage location of each car is shown by a colored pin indicating driver's working shift and bearing car's serial number. Chart has six columns for listing serial number, driver's name, and name of each passenger he car-

When a new employee applies for a ride, it is easy for the clerk to locate the car nearest that residence which has space available on the applicant's shift. The clerk gives the driver's name, address and department to the applicant, and the applicant's name, address and department to the driver. When the two have succeeded in making a satisfactory arrangement applicant returns form filled in with the driver's name, and the records are made to conform.

Only additional work required is to check records weekly against turnover lists, to drop those who have left the company, and reassign drivers or riders as necessary.

Important feature of the plan is the marking plate attached to each ridesharing car, bearing serial number

and the company trademark. Plates were first issued at the request of a number of women in the plant so they could quickly identify cars scheduled to pick them up during early morning hours.

The markers make it easy for riders to find their respective cars in the parking yard when a shift goes off duty; and they publicly mark cars as Official Driver Cars entitled to consideration for additional gasoline and tires.

A favorable feature of the plan, Ekman says, is small amount of labor required to maintain operation.

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You can handle 90% of your requirements with Willey's General Purpose Tungsten Carbide Tools, which are suitable for machining cast iron, tough hard rubber, bakelite, fibre and tough alloy steels.

Willey's General Purpose Tools give you low prices, increased production and lower operating costs. **Prempt** deliveries on these standard tools.

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This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise Na.	Width of	Opens	Weight
	Jaw, laches	Inches	Pounds
1D	31/4	31/2	121/2

Do you need a vise of ANY type?

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Cut Thread; Commercial and Precision Ground Thread Taps Special Ground Thread Taps

HY-PRO Taps have Clean, Sharp, Accurate Threads for High Production

Write for Catalog on Company Letterhead BUY MORE WAR BONDS

HY-PRO TOOL CO. New Bedford, Mass., U.S.A.

481 Mt. Pleasant Street



Shops faced with speeding up drilling production, often turn to some application of multiple spindle drills.

In some plants, it may be that a 2-spindle machine provides facilities needed. In others, machines with a good many more spindles may prove to be best. It depends on nature and volume of work. Some firms specializing in multiple spindle drills, make them in complete lines, including large and small, and with varying numbers of spindles. Controls are arranged to be readily accessible to operator from normal working po-

sition. Special adaptations are worked out to handle unusual applications.

With multiple spindle drills, versatility is highly valuable in many plants. Certain 4-spindle gang drills of the all-geared type have been found highly useful in plants where high precision needs to be maintained, and drills ensily and quickly adaptable for tapping, reaming and spot facing as well as for drilling.

Some builders of multiple spindle drills who have been long in the business and who furnish them in both vertical and horizontal types, are especially strong for hydraulic feed incorporation. Such a feed is used on a 2-way horizon-tal unit designed for reaming main bearing cross bolt holes in crankcases of 12-cyl-inder v-type liq-uid cooled aircraft engines.

Another machine, built vertically by this

firm, is designed for crankcase drilling, and also has a hydraulic feed. This machine has a hand-operated fixture and drills 108 holes. The crankcases to be drilled move on rollers from loading position into the fixture with which the drill is fitted. Here they are held in place by equalized cam clamps. It is a highly efficient layout.

There are multiple-spindle drills and tapping machines, combined, which greatly simplify production in drilling and tapping of small holes.

(Note, Machines or devices mentioned, identified on request.--Ed.)

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SWISS TYPE

GEAR HOR

... for Accuracy and speed in hobbing PINIONS **GEARS** and SECTORS

TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6º diam.

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Manufactured by The Hamilton Tool Co. Hamilton, Ohio

ARGRAVE

the right CLAMP for every job



War plants are taking our entire and gaining increased efficiency and improved re-

sults. These heavy demands make it difficult to fill all orders. See your supplier-he'll do his best to help.

Stock sizes range from 34" to 10' openings, from 1/2" to 18" deen. all patterns, all alres.



The CINCINNATI TOOL CO.

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Use Them Over and Over



DE-STA-CO ARBOR SPACERS

Measured by the number of times they can be used, De-Sta-Co Spacers are the lowest in cost of any spacers you can buy. Made of metal, they are not affected by oil or heat. Use these spacers for quick set-up of milling machine cutters and wherever low cost, accurate spacing is required.

Stock sizes .001" to .125" thick. Specials, any length, cut from bar stock, ground to decimal.

TRIAL ASSORTMENT—enough for average use on one machine sent for \$1.00. Give arbor size. Size and price list sent FREE!

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MARKING

A marking device much used for rough marking on steel, as in laying out cuts to be made freehand with the oxy-acetylene torch, is a soapstone crayon. It is used extensively in many modern weld-

It is convenient around the rolling mill and in other metal-working establishments. There are makers who specialize in talc or soapstone crayons alone. But it is notable that even large makers of crayons for all purposes, also include talc crayons for marking on cold steel. Marking on hot metal can be done to far better advantage with crayons produced for that special purpose.

One large maker furnishes crayon for marking hot metal up to 800°. A nother marks metals at temperatures ranging to 2,000°. It will not burn, smoke, run, and dries white.

Making accurate layouts on finished surfaces naturally requires highly accurate methods of marking, using very fine lines. The met hod followed, as most of us know, is to use some sort of layout dope in contrasting color, and, after dope has been applied, use a scriber to make the fine lines.

Scribing tools are available from different makers of tools, and come in different types. One favored by layout men who find it needful to reach through holes and in to other tight corners, has a point bent at a right angle to the main body of the tool.

It is usually double-ended, the bent point at one end and the other end being fitted with a straight point. Straight-pointed, single-ended scribers are also obtainable.

One favored by mechanics has a point that can be pulled out of a socket in the body, reversed, and put in the opposite way, so that the point is housed in the body of the tool. This not only protects the point of the scriber, but makes a tool which can be carried safely in the pocket.

As for the layout dope, it is available form a number of sources.

(Note: Machines or devices mentioned, identified on request .- Ed.)



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THE PRECISE 35

DIE-HEADS

Ordinarily, when die-heads are designed to open sufficiently to clear the threading that has been cut, that is all that is necessary.

But there are cases in which it is worth while to incorporate greater opening action. In one die-head designed for threading pipe, operating lever is provided, which, when moved upward by the operator, opens the die-head not only clear of the pipe proper, but of any coupling that may be incorporated. The device also has a fine-pitch adjustment screw for close settings. Once a setting has been made, there is a positive locking

device which insures accurate duplicate threading. The dies themselves are made of highspeed steel, and have a curved eccentric relief.

Parts having internal bore and external thread present a problem when threading must be concentric with the bore. This can be done by using a special type of die - head fitted with a pilot which enters the bore. and having a floating connection to the machine spindle. Such die-heads are produced by specialists and used to high advantage.

Die-heads which employ circular chasers are growing considerably in popularity, not alone because of the good work they do, but because circular chasers offer great length of life and many grinds before they wear out. In one case, it was: claimed, a set of

claimed, a set of circular chasers as used in a die-head provided by a leading manufacturer, took 184 grinds before it was necessary to discard them. In fact, there are 270° of the circle that may be utilized for cutting. Such die-heads are widely used in turning out threaded parts to Army-Navy specifications.

However, it is not to be supposed that straight-chaser die-heads are out of the picture, or that they do not pile up any extraordinary threading records. In the case of threading leg rods for canning machinery, a die-head with straight chasers produced 400 such rods per grind of the chasers.





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ALL METALS

ed ALIGNING TOOLS AND WORK in roper alignment of cutting tools with ne work is always important, and in iny places absolutely imperative.

wWhile in most cases such alignment is tigived at by providing motion or adjustinjut in the tool or the tool mounting, whre are cases where it is found better attallow the movement to take place in of workpiece. One maker of broaches that broaching equipment, recommends als of a self-aligning faceplate, when forting holes in rough castings and forgbes with internal broaches.

the starting hole is not square with

available which permit correc-tion of machine tool misalignment on hand screw machines, automatic screw machines, drilling machines and tapping machines. They are not only kept in stock in a considerable number of sizes (some of them having capacity up to tool diameters of 5")

but are also

made to order

in meeting of

special problems

or taking care of larger - sized

the broach, such faceplate allows work to

swing, under action of the broach, into automatic alignment, prevent-

ing breaking of broaches. Compensating tool holders are

work. So-called floating tool holders for screw machines have attained popularity, and are to be had from different firms. Such have an adjustment a llowing the drill,

tap, reamer or other tool to be aligned with the work immediately, even though there might be some misalignment be-tween turret and machine spindle. The problem as encountered at the turret athe is basically the same as with the automatic or hand screw machine, and makers of such tool holders therefore provide them for use with the turret lathe also.

There is a roller-drive type of toolholder, especially designed for holding taps and reamers. It has floating action, and automatically compensates for spindle misalignment.

SWAGING

To swage a piece of metal means to change its shape or form by localized pressure.

Swaging machines and swaging devices have been in use for many years. Swaging tools are used to spread the points of saw teeth on many of the saws used in the lumber industry. A saw so fitted is known as a swage - set saw. Swaging machines of earlier types were much used for pointing operations, such as pointing pins. The rotary type of swaging machine lends itself well for such work, as well as to tapering rods and tubes for various purposes. However, in addition to tapering, swaging machines also are used for straight reduction of diameters in some cases, and for certain types of assembly in others.

Where modern swaging machines are used for assembling, it is usually the case that

dies which compress the metal will reduce the section considerably at the point of joining. Because of this, and because there must be clearance to enter the work between the dies without any interference, care must be used in designing the machine so that dies will open far enough for the work to be handled.

While most rotary swaging machines are designed so dies strike fast-repeated blows against the work, one modern machine uses hydraulically-operated wedges instead. It applies the force directly at right angles to the work. Using such a



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machine, ball-type finials can be asser bled to the ends of tubular members, balls can be applied to the ends of roc

Various types of ornamental formic can be accomplished on solid bars. Tub so matched for size that one can I slipped over the end of another a litt way, can be firmly joined together I forming a groove around the two as compressing them slightly. Hose and fletible metal tube fittings can be swaged place on the hose or tube, and cable a tachments and electrical terminals mabe applied readily.



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MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

BORING BARS & CUTTERS

Importance of proper boring equipment is perhaps greater today than it has ever been. As the years pass, we find more and more bored parts entering design of machinery.

Internal combustion engines, pumps, hydraulic and pneumatic cylinders and various other elements all contribute to the general array. With so many different materials to be bored, and under so many different circumstances, a good selection of cutters is important. Some boring bar makers who produce positive locking bars of inserted cutter type, offer a choice of cutters of high speed steel, Stellite, Rexalloy and tungsten carbide.

Odd-sized holes are the bane of many a plant. One cannot purchase reamers for every odd-sized hole that comes along. On e good solution to the problem is to use special type adjustable boring cutters. They do better and lowercost work than reamers, where odd-sized holes are concerned.

Heavy duty boring bars of worm gear type are often used for boring various types of cylinders and valve ports in place on the work, and are therefore of particular value to firms building special jobs to specifications. It is always known that such a boring bar may be taken anywhere and applied with a minimum of trouble, and thus it will get mechanics in engineering shops out of many a jam.

Lathe jobs which involve boring and internal threading may run into con-

siderable detail. It is always an advantage, if possible, to have a boring tool holder that accommodates several different sizes of bars. In this way, commercial forms of bar steel may be used either for boring bars or cutters without prior machining.

There is one boring tool holder with V-block clamping arrangement. Clamping blocks are fairly long, but relieved internally in center length, so they bear on the bar only at the ends.

There being four contact points in a double-vee arrangement, relieving these blocks so they bear only at the ends which

gives eight small bearing points.

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That Will Not Score, Groove

or Chip



PRESS BRAKES

Metal bending is a big field and a big subject.

There are several angles to it. Important is bending sheet metal, plate, etc., on press brakes. For the particular type of bending work the press brake does, there is no machine tool substitute. However, there are many models of press brakes made by many builders. The particular brake installed for any given plant may easily be a matter of great importance.

Some of these brakes are regarded as utility machines, and usually have range for bending both light metal and heavy plate. As made by one company, they are particularly adapted for jobbing shop work, and when necessary can be adapted for punch press operations, in addition to the bending work for which they are primarily designed.

One should not, of course, expect any press brake to be as adaptable to punch press and other power press operations as are the presses especially designed for a given type of work.

If you are in doubt as to what a given press will do, make sure before installation. There are some firms which make a full line of power presses in addition to press brakes, Whether the work involves stamping, punching, coining, piercing, assembling, forming, cutting, shearing, embossing or drawing, such a firm will be in a position to give the best of recommendations and to guarantee press per-formances. They have no interest in selling one type of press above another. since they have them all for sale.

Ordinarily, the press brake is thought of as a massive machine. Manifestly, this is because so many shops figure on doing all the flat bending and forming on one machine. It must naturally be large enough to handle the largest jobs.

Actually, in plants where there is more than enough work to keep one or more press brakes going, there is decided advantage in having one or more smaller machines.

There are firms that build smaller press brakes, one in particular having a line which is designated as "Junior" brakes.



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MICHIGAN DRILL HEAD CO.



DUST CONTROL

Dusty conditions are unhealthy at best. When dust is abrasive in nature, coming from grinding and buffing wheels, it is much worse. Furthermore, dust is hard on machines, finding its way into bearings, slides and other operating parts, causing equipment to wear prematurely.

In plants having large batteries of grinding and buffing machines, it is best to install an adequate exhausting system, to remove dust as fast as formed. Installation of such systems has become an exact science.

It is possible, where there are only a few such machines to be served, or where

there is an isolated grinder or buffer. to install individual collectors. These are made by different firms, and very often include a box-type container set on the floor behind the machine. Into it the dust from the wheels is deposited, thru proper hoods and piping. One firm makes dustcollecting units in three sizes, so that proper units are available for all types of grinders and buffers.

There is a special type of dust collecting device, de-signed somewhat like an ordinary cyclone fan, drawing air in from the side at the center, and driving it from the outer rim of the housing. There isa difference. however. Instead of the fan expelling both dust and air at one point, and routing it to a separate device for precipitation, the ing is handled by the same unit. This saves considerable space otherwise taken up by ad-

ditional piping. There is also a saving in power.

In the case of dusts tending to cake, due to contained moisture, separating and precipitating devices are provided with a water spray, which keeps dust washed away rather than allowing it to accumu-

late and pack.
Glass fiber filtering units are extensively used for various purposes, these days. Some are incorporated in dust units for grinding and buffing wheels. It is obvious that sparks from such wheels can never set spun glass filters aftre.

One such dust collector has a suction

fan of 600 fpm capacity.

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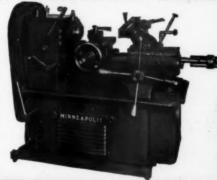
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Planer finish also available in both styles. All plates are furnished with lifting handles and finished wood covers.



OMESTED DOVERNOR CORPORATION

SENSITIVE DRILLS

In selection of sensitive drills, an important point is the required amount of overhang on the drill spindle for handling the largest work coming in the shop. No good point is served in having a drill of far greater capacity in this respect than is needed. On the other hand, care should be used that the bulky jobs may be handled.

One manufacturer of a line of sensitive drills, realizing this, provides three different units, having 8", 12" and 15" overhang, respectively. These drills are used extensively in the airplane and automotive industries.

A special drill is available fitted with a universal arm. swinging over a table of large area, with a vertical drill spindle of sensitive feed type mounted at the outer end of the swinging arm. It is designed for fast handling of large layouts of holes; has six quick speed changes, and is fitted with a tapping mechanism. The same firm also builds a line of sensitive drills of regular style, som e of which are fitted with back gear units to provide eight standard speeds ranging from 185 to

Some are fitted with a built-in tapping attachment, and are suited for drilling, counterboring, spot facing, tapping and other operations.

For drilling smaller holes, a drill of the super-sensitive type is highly favored. One of these has an arm swinging radially on a round column, and can be locked at any position thereon. The arm extends to the back, to support the

motor, and to the front to hold the drill spindle, so it is well balanced on the column. Range of this machine is for small holes only, varying from a diameter of .004 to .250".

Relatively small tool rooms may need sensitive drills only occasionally. It is interesting to know that combination machines are available for toolroom use, incorporating sensitive drilling spindles, including in addition small precision lathes, small horizontal mills and vertical millers.

Where such machines fit in, they are real savers of floor space, also.

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Magnifies small parts under strong, shadowless fluorescent light, Quickly exposes faulty or torn threads, cracks, burrs and other defects not apparent to the naked eye. A four inch lens allows a wide field of vision for both eyes without eyestrain.

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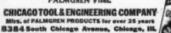


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PRECISION WORK AT ANY ANGLE

BRAKES

An important element demanding close attention of manufacturers who make brakes for machines and industrial equipment, is friction material used.

Many brake linings incorporate woven asbestos. However, the main concern of the manufacturer is not an analysis of the lining itself, but rather to obtain a dependable source of supply lining with high coefficient of friction, and one that will wear well. This is not a difficult matter, for there are a number of manufacturers of good linings.

Did you ever get into a design problem

where you had a machine that seemed to offer no consistent place where a brake might well be installed?

One of the best answers, if it is a machine that allows use of motor drive, is a special type of motor, known as a discbrake motor. It is built with a brake incorporated, the such that when the current is shut off. a disc-type friction device automatically engages, and brings motor and the device it drives to a quick stop. On the other hand. when the current is applied, friction device is opened and held open. The entire device is very compact.

Electricity can of course be used for course be used for engaging a brake, and magnetic brakes are built by different firms. There is one brake of direct - current type that is quite radically different from all others, acting to close two opposed brake blocks upon the brake wheel. The brake block linings are thick and

tough, and allowance is made for considerable wear before they need to be replaced. These brakes may be manually released, and come in a number of sizes.

Traveling bridge cranes are especially efficient when fitted with hydraulic foot brakes.

One firm furnishes two different types of these brakes, both hydraulically actuated. One is designed for use on inside cranes.

(Note, Machines or devices mentioned, identified on request.—Ed.)

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LUCKY TOOLMAKER AD

MACHINE TOOL BLUE BOOK

542 South Dearborn Street, Chicago, Illinois

DRILLING HEADS

Use of various special drill heads is a phase of the metal working industry continually assuming increasing importance. Many are now using multiple drill heads, which, applied to single spindle drills, speed up operation to a great extent.

One firm which provides multiple drill heads for this purpose, makes both four and two-spindle units, with the two-spindle heads so arranged that distance between the two drill centers is infinitely adjustable within its scope.

Firms specializing in furnishing drill heads to order, so that drills will be a given distance apart on centers. are able to carry stock drill head cases, stock gears of different sizes, etc., so that by taking a stock case and boring it according to the orassembling der, stock gears and other parts, a drill head can be made up and shipped very quickly.

In addition, they supply multiple spindle tapping heads.

Special single spindle drilling heads are now available with metered feed, which may be used for either drilling or reaming. One drills anything from wood to hardened steel, or anywhere in between, without any change in the machine, handling any size of drill from a number 68 to 3/4" diameter. These heads are so designed that instead of beimmediately released upon reaching bottom of hole, they make

several extra revolutions without any forward movement. This assures an absolutely smooth bottom surface, and allows holding tolerance of .002" on the depth of either plain or stepdrilled holes.

An automatic drilling unit which gets away from a positive power feed mechanism has been put into use by some. It compensates automatically for hard spots encountered in the material, as well as for gradually dulling of the drill as the work progresses. This is done by using centrifugal force for feed pressure.

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More than just a satisfactory substitute for Plates are a distinct improvement — definitely superior in every respect. Cut from solid blocks of natural granite—far harder than any tools which will be used on them —they are absolutely warp-proof and re-main accurate to 1/10,000 inch overall. Because they do not become charged with actoratives, even when used near grinding machinery, wear on tools is virtually eliminated. Both rust and corrosion-proof, they are practically indestructible. Already in nation-wide use in scores of important



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STANDARD SIZES AND WEIGHTS 12"x18"- 75 lbs. 18"x24"-160 lbs. 20"x30"-275 lbs. 24"x36"-480 lbs.

Special Sizes on Request.

Prices are Reasonable.

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FASTER!

Make up for shortage in man-power by doing your sheet-metal cutting with this time-saving electric hand-shears. Takes only a minute to cut 6½ feet of 14-gauge sheet steel. Easily shears 16-gauge stainless

Easy to guide around curves as well as along straight lines. Light to handle. Weighs only 6 lbs.

Alloy steel cutters. Ball-bearing, grip-type Universal meter, 1/8 horse power. Operates

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Man-Power

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MOTORIZED DRIVES

One of the most interesting trends in modern power transmission is application of independent motorized drives directly to machine tools.

Some have gone quite extensively into building such drives, and offer them in several types. One company is in position to furnish V-belt drives, gear motor drives, and also four speed drives of the gear box variety. An obvious advantage of obtaining a motorized drive from a firm handling many different kinds is that the firm has no interest in selling a specific type and forcing it to a task for which it might not be adapted. They will naturally furnish the best drive for the purpose in any given case.

There are cases where reversibility in a drive is well worth having. Take trying out of dies in a press. If you have a drive with instant reversibility the advantages are obvious. At least one firm makes a four-speed drive of helical geared type, that allows instant reversibility on any one of the speed changes which are obtained thru a gear shift.

Punch presses, lathes, milling machines, drill pres-ses and shapers have all been fitted advantageously with drives of this kind. A handwheel is incorporated permitting rotation of machine spindle for setup work without danger to the operator.

Because design of a motorized drive usually contemplates holding the equipment in as small a space as

consistently possible, belt drives incorpo-rated are short, as a rule. Tho V-belts are quite often used, it is a fact that very short belt drives call for closer control of tension than longer ones.

In the case of one line of modern motor drives which can be attached to the machine by bolting to frame, a simple but positive crank-and-dog-cam adjustment has been incorporated by means of which belts are kept at proper tension.

There are cases, where motorized drives are desirable on machine tool, and where it is desirable to obtain controlled speeds.

CENTERING

One thing never to be overlooked in centering, if there is any large amount of it to be done, is to have sufficient modern combination center drills on hand for different work diameters. These tools. combining a short center drill with an integral countersink, are far better than using the method of first drilling on center, then using a separate countersink.

Combination center drills may be had in special alloy and high speed steel, varying from a 3/64" drill with a ½" countersink body to a 5/16" drill with a ½" countersink body. The countersink incorporates an included angle of 60° on the standard tools, available in 13 different sizes between limits mentioned.

Tools incorporating other included angles may be obtained on special order, where desired.

There are shops without a standard centering machine, not having enough work to justify use of combination centering drills and standard machines.

Some of these use a special type of chuck in drill presses for centering relatively short work. These are known as universal centering chucks, have a female conical end which serves to guide the drill to the exact center, and are furnished with a set of bushings and collets which makes the same chuck adaptable for various sizes of center drilling.

Where there are many shaft-type units to be centered on a production basis, it is a machine that centers both ends at once which shows greater speed.

However, to reap the benefits of a double-end centering operation in which



both ends are centered at one pass by two centering drills, it is needful that shafting length be accurate. However, such accuracy is often needed from other standpoints as well.

It is interesting to observe that a machine has been put into use which mills both ends of a shaft to length and then centers both ends in the same handling. This machine handles shafting anywhere from 1½ to 6" diameter, and from 14 to 72" long.

A similar machine made by the same firm handles shafts from 1 to 4" diameter, and anywhere from 8 to 48 inches long.

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RECREATION—RESOURCE OF WAR: publication of Federal Security Agency, prepared to help communities in war areas, meet off-the-job needs of war workers and families. Describes experiences of some communities which may serve as examples of what can be done. No charge. Division of Recreation, Federal Security Agency, Social Security Building, Washington 25.

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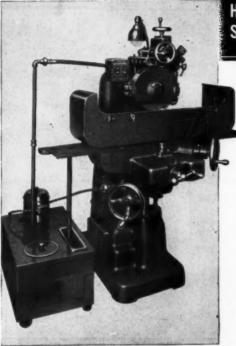


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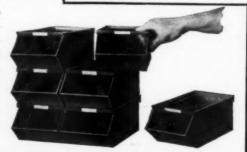
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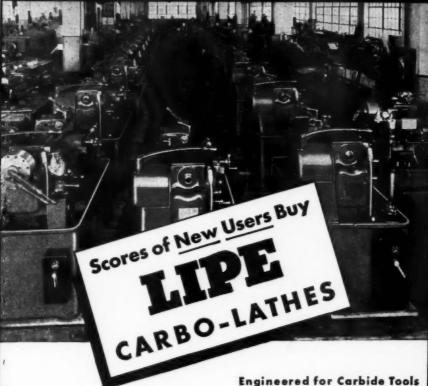
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